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OF

OTOLOGY

EDITED IN ENGLISH AND GERMAN

BY

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ARCHIVES OF OTOTOLOGY.

THE OCCIPITAL BONE IN OTOTOLOGY AND RHINOLOGY.

By ERNEST DE WOLFE WALES, M.D.

(With two illustrations on Text-Plates I and II.)

THE occipital bone forms part of the posterior and basilar surfaces of the skull and consists of four parts which meet round the foramen magnum, represented by separate bones in the lower vertebrates (Macalister). These parts are called the supra- and basioccipitals medially and the two exoccipitals laterally. The basioccipital, or basilar process, is in relation to the sphenoid sinus and the vault of the naso-pharynx, and the two exoccipitals are in relation to the petrous portions of the temporal bones. Thus pathologic processes affecting the occipital bone may enter the realm of otology and rhinology.

Some of the relations of the occipital bone to important structures are as follows: anteriorly the basioccipital portion is in relation to the sphenoid bone and on either side to the apex and posterior inferior surface of the petrous bone. Laterally the exoccipital portion is also in relation to the posterior inferior surface of the petrous bone. The sigmoid sinus grooves the intracranial surface of the exoccipital portion and the outer border helps form the jugular foramen. The inferior petrosal sinus grooves the outer border of the intracranial surface of the exoccipital and basioccipital bones. The medulla oblongata rests on the intracranial surface of the basilar process, or basioccipital bone. Furthermore there is a complicated

and inconstant system of veins, a plexus, which connects the vertebral vein with the sigmoid sinus. The carotid artery is in relation to the lateral anterior part of the basilar process. Inferiorly the basilar process forms the roof of the naso-pharynx. From this portion the nasopharyngeal tonsil hangs.

From the sphenoid sinus the direction of the basilar process is backward and downward. Close to the posterior wall of the sphenoid sinus the basilar process is about $2\frac{1}{2}$ centimetres wide and $1\frac{1}{2}$ to 2 centimetres in depth. As the basilar process extends backward and downward toward the foramen magnum it becomes gradually shallower while the width slightly increases. Near the foramen magnum the depth is $\frac{1}{2}$ centimetre or less. The structure of the basilar process is cancellous surrounded by a dense cortex. The cortex forming the posterior wall of the sphenoid sinus is generally thinner than the intracranial or pharyngeal surfaces. The sphenoid surface may be convex, flat, or concave according to the shape of the sphenoid sinus. According to Testut the basilar process may contain real cavities which he calls basilar cells or sinuses. These sinuses may communicate with the sphenoid sinus. This cancellous structure of the basioccipital or basilar process extends to either side of the foramen magnum, in the exoccipital portions becoming broad and shallow in extent and then deepening and narrowing beneath the articular condyles. From the outer posterior half of the articular condyles this cancellous structure spreads outward, covering the inner third of the sigmoid sinus formed by the occipital bone. These bone cells connect with the mastoid cells internal to the digastric fossa between the facial canal and the sigmoid sinus. Hyrtl first described, in 1860, a communication between the cells of the occipital bone and the cells of the temporal bone.

Thus there is a line of continuous cells and sinuses from the sphenoid sinus to the mastoid cells. This cellular

ILLUSTRATING DR. ERNEST DE WOLFE WALES'S ARTICLE ON "THE OCCIPITAL
BONE IN OTOLOGY AND RHINOLOGY"

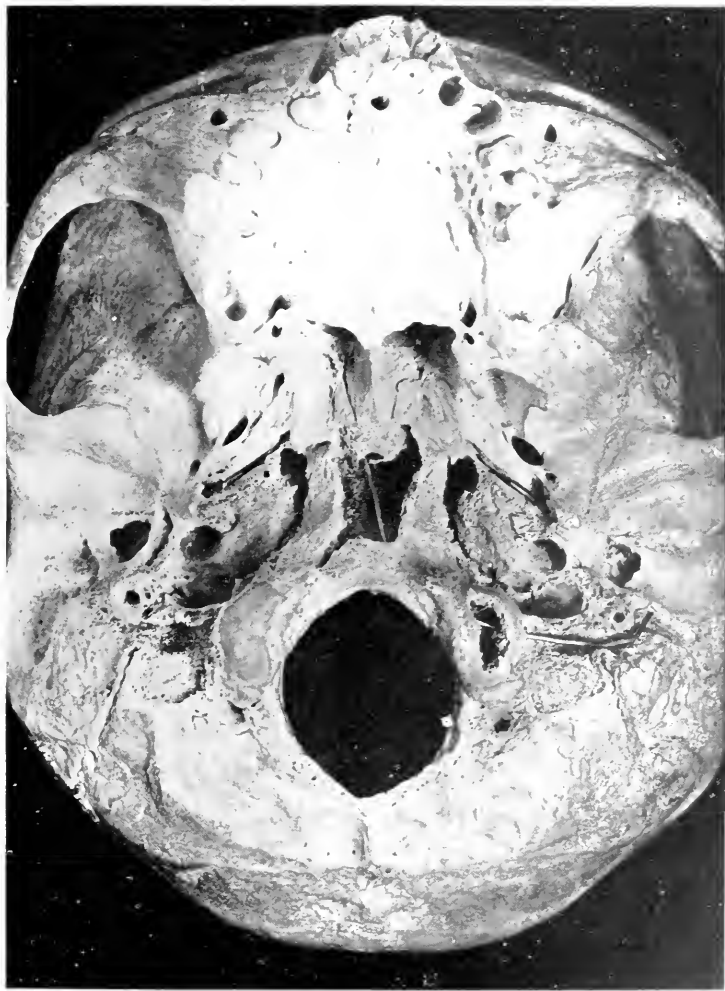


FIG. 1.

route is shown in Figures 1 and 2, in which most of the extracranial cortex of the occipital bone has been removed including the cellular structure, and a probe passes from the sphenoid sinus to the tympanic cavity of the middle ear. The distance from the posterior wall of the sphenoid cavity to the mastoid cells posterior to the jugular fossa is about $6\frac{1}{2}$ centimetres.

The reason for a study of the occipital bone was occasioned by a case which I observed at the Massachusetts Charitable Eye and Ear Infirmary, Boston.

A boy, aged seven, entered the Infirmary February 2, 1906, for the removal of adenoids. Operation under ether. Too great force with a Beckmann curette in the hands of an inexperienced interne, combined with a thin cortex of the inferior surface of the basilar process of the occipital bone, may account for the following history. Immediately on recovering from the effects of ether, the boy complained of occipital headache which increased in severity. On the third day he developed tenderness over the right mastoid process with pain. Drum membrane slightly reddened; all landmarks visible; whispered voice heard at 6 metres; redness and bulging of the posterior wall of the external auditory canal. Boy had a septic appearance. Mastoid operation: antrum apparently normal. Pus found in deep intracranial cells around sinus and tip. No culture made. Boy's right infraorbital region began to swell, and became erythematous, resembling erysipelas. Removed to contagious ward. Septic temperature; no improvement after operation. Tenderness in back of neck after operation. Condition worse. Temperature very irregular, ranging as high as 107° F. Tenth day R. eye developed exophthalmos, chemosis of lids, and optic neuritis. Diagnosis, thrombosis of cavernous sinus. He became comatose and had frequent epileptiform attacks. Left lid and eye began to show the same signs as had appeared on the right. Death on the 14th day. Necropsy: thrombosis of both cavernous sinuses. Right sinus filled with pus. Left, clot not broken down. Pus in mastoid cells. No clot in sigmoid sinus or jugular bulb. Streptococcic infection.

Did infection extend to the mastoid by way of the occipital bone from the injured basilar process, or had the middle ear become infected by pneumococci, which inflammation had quieted down in the tympanic cavity to flare up later in the mastoid cells at the time of the streptococcic infection? The sphenoid sinus contained pus.

Conclusion: The basilar process of the occipital bone may be injured in removing the naso-pharyngeal tonsil. Too much force should be avoided. Just enough force to cut the adenoid growth, which depends upon its consistency and the sharpness of the cutting instrument. Injury to the basilar process may, by extension, cause infection of the sphenoid sinus, and finally thrombosis of the cavernous sinus. It is a question whether infection can extend backward and laterally through the cancellous structure of the occipital bone to the mastoid cells of the temporal bone. Suppuration of the temporal bone may extend to the occipital bone. Thrombosis of the sigmoid sinus from otitic disease may extend to the vertebral plexus and the deep veins at the back of the neck (Macewen). In cases with occipital headache or swelling and tenderness of the back of the neck, one should examine at necropsy the bone marrow of the occipital bone for osteomyelitis.

ILLUSTRATING DR. ERNEST DE WOLFE WALES'S ARTICLE ON "THE OCCIPITAL
BONE IN OTOTOLOGY AND RHINOLOGY"



FIG. 2.

HEADACHE CAUSED BY PATHOLOGIC CONDITIONS OF THE NOSE AND ITS ACCESSORY SINUSES.

BY

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THE affections of the nose and its sinuses which produce, among other symptoms, more or less severe headache, naturally divide themselves into (1) non-inflammatory and (2) inflammatory conditions.

1. The non-inflammatory group represents the class of cases, with hypertrophies of the middle turbinate bone, which press against the septum. The latter may or may not be deflected. Or there may be in this group adhesions between the inferior turbinate and septum, or between the inferior and middle turbinates and the septum. Or, again, the turbinate may be of practically normal size, but may be pressed upon by a markedly deflected septum. These so-called pressure cases are responsible for a large number of headaches. This group may be divided into two subdivisions. In (*a*) the pain occurs in individuals not constitutionally prone to headaches; while (*b*) represents cases which have what we

might term a neuropathic temperament plus pressure within the nose. In these people the sensibility to pain is a heritage. Usually there is a family history of migraine, neurasthenia, epilepsy, alcoholism, rheumatism, or gout. These patients have a low reserve of nervous endurance and readily succumb to slight continuous peripheral irritation.

2. The inflammatory group may likewise be divided into two subdivisions: (a) including cases where there is pressure within the nose, plus chronic sinusitis; while (b) deals with acute sinusitis.

1. (a). *Pure Pressure Cases.*

CASE 1.—Almost constant left-sided supra-orbital headache since childhood. Marked deflection of nasal septum to left, pressing against middle turbinate. Submucous resection. Complete cure of headache.

Mrs. H., age 38, gives a history of an injury to the nose in childhood. She has had headache since childhood, growing worse in the last ten years. Pain is complained of almost constantly, and is felt above the left brow and in the left temple. The pain is dull with occasional severe exacerbations, when it becomes acute and is then accompanied by vomiting.

Examination.—The nasal septum shows an acute angular deviation to the right, close to the floor of the nose. There is a corresponding sulcus on the left side with a slight deviation to the left, completely obliterating the view of the middle turbinate on that side. There is compensatory hypertrophy of the left inferior and of the right middle turbinate. Adrenalin applied to the left side of the nose gives temporary relief.

Operation.—A submucous resection was performed, removing the deformed parts of the septum.

Six months later the patient reports that she has been absolutely free from headache since operation.

CASE 2.—Unilateral headache of twenty years' duration; deflection of septum to left with adhesion to middle turbinate. Submucous resection of septum and separa-

tion of adhesion, followed by complete relief from headache.

Mr. G. M., age 23. Habits temperate. No venereal disease. Two attacks of rheumatic fever, 8 and 18 years ago. Malaria in childhood. Series of boils on the neck in 1904, lasting seven months. Occasionally subject to eczema. Bilious attacks off and on all his life. Dyspepsia from 1895 to 1900. For twenty years has had unilateral headache, growing gradually worse until now it occurs daily. It comes on at eleven o'clock and increases in severity until bedtime. He is frequently obliged to give up his work in the afternoon and go to bed. Headache is worse in the summer-time. Pain is felt over the left side of the bridge of the nose, over the left supra-orbital region, and in the left temple. It is rarely accompanied by vomiting.

Examination.—Nasal mucosa and turbinates normal. Septum deflected to the left, deviation beginning $\frac{1}{2}$ inch above the floor of the nose and extending above the left middle turbinate, which is firmly adherent to it.

Operation, December, 1906.—A submucous resection was done, removing the septum to a point above the middle turbinate and back almost to the naso-pharynx. The middle turbinate was then separated from the septum. From the time of operation to the present, the patient has not had a single headache.

CASE 3.—Dull pain over left eyebrow. Long adhesion between inferior turbinate and septum. Operation. Cure of pain.

Mrs. H. S., 25 years of age. Good family history. Tonsils were removed one month ago for recurrent quinsy. For five or six years she has suffered from a dull supraorbital pain, sharply localized, coming on every morning and lasting one or two hours. There is a post-nasal discharge, greenish in character.

Operation, November 26, 1907.—A long adhesion between left inferior turbinate and septum was removed by a submucous resection of septum over point of contact. No headache since operation.

I. (b). *Pain Caused by Septal Turbinate Contact in a Person Constitutionally Prone to Headache.*

CASE 4.—Headaches of a migrainous type, due to middle turbinate bones pressing tightly against the septum. Partial bilateral turbinectomy, followed by entire relief from the pain on one side of the head, and marked diminution of that felt on the other side.

Mrs. K. G. M., age 35. Her mother suffered from typical migraine. Sick headaches from the age of four to fourteen, occurring at intervals of one to two months. These headaches are accompanied by vertigo, vomiting, some aphasia, ocular disturbances (scintillating scotoma), and numbness of the extremities. The headaches are sudden in their onset and in their disappearance, lasting only a few hours. The pain is of a pounding, pulsating character, and is felt all over the front of the head. From puberty until twenty-two she did not have a single headache. At twenty-two, after severe exposure to cold during menstruation, the headaches returned in their old form, with the exception that the vertigo and vomiting were absent. From this time until the time of operation the headaches occurred from one week to one month apart, depending largely upon the patient's general condition. The use of glasses gave no relief.

Examination.—Anterior ends of both middle turbinates press tightly against the septum.

Operation, October, 1905.—The anterior tip of the right middle turbinate was removed, with complete relief of the headache on that side of the head. Following this operation the headaches still occurred at the same intervals, with pain only, however, on the left side.

Fourteen months later the anterior tip of the left turbinate was removed. Since then the character of the headaches has changed. They occur at much longer intervals, the pain is dull, the ocular symptoms are much diminished, aphasia and numbness of the extremities are absent. On the left side of the nose the turbinate contact is not entirely relieved. The patient's headaches now originate over the left eyebrow, and can always be aborted by the application of cocaine to

the left middle turbinate. It will undoubtedly be necessary to operate again, to remove that portion of the left middle turbinate which is in contact with the septum before the headaches are entirely cured.

2. (a). *Cases where the Headache is Due to Enlarged Turbinates, plus Chronic Sinusitis.*

CASE 5.—Asthmatic patient who suffered from supra-orbital, frontal, and occipital headache for three years. Polypoid degeneration of the middle turbinates, ethmoiditis. Operation. Complete cure of headache.

Mrs. J. P. age 20. Presented herself in September, 1907, complaining of dyspnœa, frequent asthmatic attacks, cough, weakness, loss of flesh, and constant severe pounding headache in the supraorbital, frontal, and occipital regions. These symptoms have been present for three years.

Examination.—Polypoid degeneration of both middle turbinates, with a profuse mucoid and occasional muco-purulent discharge from both nares.

Operation.—Removed middle turbinate and curetted anterior ethmoidal cells of one nostril. After a short interval, performed same operation on the other nostril.

At the present time, headache has entirely disappeared, cough and dyspnœa are not complained of except to a slight extent on exertion, the asthmatic attacks are light and of rare occurrence, and the nasal discharge is much improved. Weight has increased 15 pounds.

CASE 6.—Bilateral, supraorbital, and temporal headache since childhood, due to hypertrophied middle turbinate bones, with ethmoiditis. Cured by partial bilateral turbinectomy.

Mrs. E. K., age 25. Headaches since childhood. Pain is felt almost constantly in the supraorbital and temporal regions, usually on both sides at the same time, though occasionally only on one side. The pain is dull and is increased by bending forward. The pain increases in severity when the patient catches cold or when her nose becomes congested

from any cause. Coryzas are frequent and are accompanied by a thick yellowish discharge through both anterior and posterior nares.

Examination.—Both middle turbinates are enlarged and impinge against the external nasal wall for about one-half their length antero-posteriorly.

Operation.—The anterior portions of both middle turbinates were removed, and the remaining portions trimmed so as to relieve septal contact.

Three months later patient reports by letter that she is entirely cured of her headache.

CASE 7.—Supraorbital headache, with pressure sensations over bridge of nose, caused by bilateral chronic suppuration of the frontal and maxillary sinuses. Operation, followed by improvement.

A. J., male, age 23. Nine years ago, after being nearly frozen to death, he noticed a purulent discharge from the right side of the nose. Four years ago a discharge of a similar character made its appearance in the left nostril. At the same time a dull supraorbital headache developed. At present dull pain is felt over both eyebrows, and pressure symptoms over the bridge of the nose. The patient complains of lassitude and mental dulness.

Examination.—Patient's breath has a foul odor. A thick, yellow, scanty, purulent discharge is seen in the anterior and posterior nares. Nasal septum deviated somewhat to the left, with a prominent ridge over the line of deviation. Both middle turbinates are enlarged and polypoid, the left one impinging tightly against the septum. Transillumination reveals nothing. Trochar puncture and irrigation of maxillary sinuses brings away some scanty, thick, foul pus. There is some tenderness to pressure over the floor of the frontal sinuses.

Operation, June, 1907.—About half of each middle turbinate was removed, with the anterior ethmoidal cells. Both maxillary sinuses were opened through the inferior meatuses, and permanent drainage was established. The patient, being intelligent, was taught to attend to the irrigation of these sinuses himself.

At the present writing the patient reports the left maxillary sinus free from discharge. From the right he occasionally washes out a little thick pus. The mental lassitude has entirely gone and the headaches have disappeared, except for slight dull pain occasionally experienced in the right supraorbital region. It will probably be necessary to do a radical operation on this side.

2. (b). *Acute Sinusitis.*

CASE 8.—Right supraorbital headache, pain over right maxillary antrum and in teeth of upper jaw, together with right-sided exophthalmos caused by acute frontal and maxillary sinusitis following influenza. Intranasal operation. Relief.

Mrs. G. H. H., age 25. Was seen by one of us (Cocks) in consultation with Dr. J. H. Borden, of Tarrytown, N. Y. The patient, who is nursing a child of 8 months, has always been well excepting for typhoid fever four years ago. This was followed by a cold in the head and some frontal headache, lasting two weeks.

Eleven days ago had influenza with sore throat, fever, and pain in the limbs. Five days later, dull pain developed over right maxillary antrum, which was present almost constantly. The teeth of the right side of the upper jaw ached. There was also tenderness of the roof of the right side of the mouth. Two days later she experienced intense pain over the right eyebrow, temple, and ear. The pain over the antrum of Highmore abated somewhat after a few days, but the frontal headache was severe enough to necessitate a dose of morphine.

When first seen on January 2, 1908, the temperature registered 101.5° by mouth.

Examination.—Slight swelling of the cheek over right maxillary antrum, and moderate right exophthalmos. Nose narrow. Low deflection of septum into right nostril with corresponding sulcus in left. Right middle turbinate is somewhat hypertrophied, slightly polypoid, and adherent to septum anteriorly. Pus between turbinate and external wall.

Operation.—As patient's pain was increasing, in spite of

treatment for four days by nasal irrigations and the use of adrenalin, the anterior portion of right middle turbinate was removed and the right maxillary antrum pierced with a trochar. Irrigation of antrum washed out considerable pus. Result : the exophthalmos and antral pain disappeared in 24 hours. The temperature became normal two days later, and the supraorbital pain was completely gone five days after operation.

CASE 9.—Headache, pain over right antrum of Highmore, and aching of teeth from acute maxillary sinusitis caused by influenza. Nasal irrigations. Complete relief.

M. S., young woman, 19 years old. Always well except for present illness. December 21, 1907, prostration, fever, running from both nostrils, headache beginning in front and extending to occipital region. On December 24th, the pain localized over right maxillary antrum. Dull aching pains were also felt in back of right eyeball and in temple. Dull, almost constant, aching pains in teeth of right upper and, to a certain degree, in those of right lower jaw. On December 27th, she noticed a yellowish discharge from the right nostril. The discharge from the left has disappeared.

Examination.—Marked tenderness over anterior surface of right maxillary antrum. Right middle turbinate is swollen and in contact with septum anteriorly. Between external nasal wall and right middle turbinate is considerable pus. Temperature varies between 99° and 101° F. by mouth.

Treatment.—The pain and other symptoms were completely relieved in 36 hours by nasal irrigations of hot boric acid, preceded by the use of adrenalin. Coal tar products were given internally, but this last is usually unnecessary.

CASE 10.—Pain over right supraorbital region due to acute frontal sinusitis, following grip. Simulates supra-orbital neuralgia. Treatment by irrigation. Relief of pain.

Anna T., 21 years old, contracted influenza three weeks ago. One week ago complained of pain over right supra-orbital region, which was severe and almost constant.

Examination.—No tenderness over frontal sinus and no

temperature, yet the middle turbinate of the right side is large and puffy, and a discharge of yellowish pus is seen coming down between it and the external nasal wall. Treatment—adrenalin and irrigations—completely relieved the pain in 24 hours.

In the *Annals of Otology, Rhinology, and Laryngology*, February, 1902, DR. JONATHAN WRIGHT reported a unique and instructive case of isolated, unilateral, chronic empyæma of the sphenoidal sinus, causing headache, delirium, and mental symptoms. Operation resulted in complete recovery. Almost a year before the patient came under observation he had an attack of grip, accompanied by coryza and pain in the head. Six months later he again suffered from severe headache, of several weeks' duration, but on this occasion there were no nasal symptoms. After a month or six weeks the pain returned with great severity. It was of a bursting, boring character, and was felt over the vertex, occiput, and left side of the head. There was great hyperæsthesia of the scalp. He had frequent attacks of sneezing, and occasionally expectorated lumps of mucus. A low wandering delirium finally developed and the patient took to his bed.

Examination of the nose was negative. The ophthalmoscope revealed a slight neuro-retinitis.

Operation under general narcosis, by the intranasal route, about eleven months after the onset of his original symptoms, revealed a left-sided sphenoidal empyæma. An external operation a week later, performed for the relief of the persistent delirium, demonstrated the fact that the other sinuses were normal. Seventeen days after the first operation the patient was completely cured.

Résumé: These cases represent fairly well the different types of headache due to lesions within the nose and sinuses. In the first three cases the headache was due to pressure. Mere septal turbinate contact is not sufficient to give rise to pain when the individuals are not constitutionally prone to headache. To cause pain there must be considerable pressure. As a rule the pain is fairly well localized over the affected side or sides. It is felt in the orbit, the nasal bridge, and often in the temple.

It is always aggravated by any nasal irritation, and is often temporarily relieved by the application of adrenalin or cocaine to the affected region within the nose.

In Case 4 there is an absence of the tendency which the pure pressure cases show toward exact localization of the pain to certain well-defined areas. This is doubtless because the patient has a migrainous temperament. Her pain was pounding and pulsating in character, and was felt all over the front of the head. It will be necessary to remove the septal turbinate contact, which still persists in one nostril, before the woman is completely relieved from the occasional unilateral pain from which she suffers.

In Case 5 the pain was supraorbital, frontal, and occipital, due to chronic ethmoiditis plus polypoid middle turbinates.

In Case 6 the ethmoiditis apparently did not change the character of the headache, which was supraorbital and temporal, but fairly well defined.

Case 7 suffered from supraorbital headache, pressure sensations over the bridge of the nose, and considerable mental lassitude and dulness. The last two symptoms were relieved very promptly by draining the maxillary antra, from which there had been considerable absorption of septic material.

Hajek, in his book, *Die Krankheiten der Nebenhöhlen der Nase*, says: "Headache is a frequent though not constant symptom in all cases of inflammatory disease of the nasal accessory sinuses. In an individual case headache may be very inconstant. Intervals in which the patient is entirely free from pain may alternate with periods of the most intense pain."

The explanation is simple. There may be an exacerbation of a chronic empyæma, or there may be accumulation of secretion caused by the temporary closure of the excretory duct.

We have found that localization of pain in certain regions of the head is not typical for the affections of the

different sinuses. For example, pain in the forehead may be caused by inflammation of the frontal, ethmoidal, maxillary, or even the sphenoidal sinus. On the other hand, the characteristic pain of sphenoidal disease is felt in the occiput, behind the bulb—as one writer has expressed it,—or over the vertex. In maxillary sinusitis the usual point for the pain is over the anterior surface of the antrum, as well as in the teeth of the corresponding side of the upper jaw. Frontal sinusitis generally produces pain in the forehead, especially over the course of the supraorbital nerve. In many cases of frontal-sinus inflammation the pain is characterized by periodicity. At a certain time in the morning, usually ten or eleven o'clock, furious pains are felt over the affected sinus which persist for hours—perhaps until one, two, or even four o'clock in the afternoon—and then suddenly disappear. For the remainder of the afternoon and during the entire night the patient remains free from pain. On the following day the pain recurs at exactly the same hour.

From a review of the nerve supply of the nasal fossæ and cavities, we can explain the location of the pain in certain of the sinuses, but not in all. The innervation of the nose includes the special olfactory fibres which have to do with the sense of smell,—but which do not concern us here,—and those of common sensation derived from the ophthalmic and superior maxillary divisions of the trigeminal nerve. The lateral wall of the nasal fossa is supplied from several sources, including the upper posterior nasal branches from Meckel's ganglion, and the lower posterior nasal branches from the larger palatine nerve behind; and, in front, the external division of the nasal nerve and the nasal branch of the anterior superior dental, which also distributes twigs to the floor of the fossæ. The septum receives its chief supply from the naso-palatine nerve, supplemented by branches from Meckel's ganglion behind, and, by the internal division of the nasal nerve in front. The mucous-membrane lining the antrum

receives filaments from the infraorbital nerve by means of its superior dental branches. The frontal sinus is supplied by twigs from the supraorbital and the nasal nerves; the ethmoidal air cells, by minute branches from the nasal; and the sphenoidal sinus, by filaments from the spheno-palatine ganglion.

We see, therefore, why, in the case of frontal-sinus disease, pain is referred to a point in the forehead over the anterior wall of the sinus, corresponding to the distribution of the supraorbital nerve. In the same way, in the case of the maxillary antrum—which, as we have just seen, is supplied by twigs from the infraorbital nerve—we can account for the pain being felt in the cheek and in the teeth. Hajek has suggested that there is set up a kind of neuritis of the nerve in question. When we try to explain why pain from disease of the sphenoidal sinus is usually experienced in the occiput, we fail to find any reason why sensory impulses coming from this particular sinus to Meckel's ganglion should be experienced as pain in the occipital region. The paths of the afferent nerve fibres in this locality have not yet been accurately worked out.

We have tried to show from the study of these cases what an important place the nose and its accessory sinuses occupy in the production of headache, and how necessary it is to carefully examine these organs when confronted with an obscure case.

THE VALUE OF THE LEUCOCYTE COUNT IN THE DIAGNOSIS OF ACUTE INFLAMMATORY DISEASE.¹

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THE value of the leucocyte count, the differential count of leucocytes, and the relationship they bear to one another in the diagnosis of acute inflammatory lesions have been the subject of much investigation, many contributions to medical literature, and some controversy. Since the appearance of my first communication on the subject about three years ago, the frequent employment of this method in both hospital and private practice as an aid in diagnosis and prognosis bears testimony to its usefulness. In a series of papers written subsequently further personal experiences have been detailed, and one read before the Surgical Section of the Academy in December last voices my present opinion in the matter. I am before you this evening on the same subject at the request of your Secretary and can but repeat what was said then and add a few words concerning additional refinements which have been described in the meantime.

When making use of the leucocyte count, the differential count, and their ratio in the diagnosis and prognosis of inflammatory lesions, the increase in the relative number of polynuclear cells is an indication of the amount

¹ Read at a meeting of the Otological Section of the N. Y. Academy of Medicine, November 8, 1907.

of toxin absorbed, and the increase in the total number of leucocytes is the evidence of the body resistance to this absorption. Consequently the differential leucocyte count alone or the total leucocyte count alone is not as instructive as the combined figures, because the relative disproportion of the polynuclear cells to the total leucocyte count is the best indication of the severity of the process.

Slight increase in the relative number of polynuclear cells usually indicates slight infections, while decided increase indicates severe infection. Slight polynuclear increase with slight leucocytosis indicates slight infection and fair resistance, while slight polynuclear increase with high leucocytosis indicates slight infection and pronounced resistance. Decided polynuclear increase and pronounced leucocytosis indicates severe infection and good resistance; decided polynuclear increase and slight leucocytosis indicates severe infection and poor resistance; and decided polynuclear increase and no leucocytosis indicates severe infection and no resistance. Increasing polynuclear count with decreasing total leucocyte count indicates greater severity and diminishing resistance, while decreasing polynuclear count with decreasing total leucocyte count indicates improvement. Dr. C. L. Gibson in *Annals of Surgery*, April, 1906, reaches the following conclusions concerning the value of the method in cases of general surgery:

"The differential blood count and its relation to the total leucocyte count is at present the most valuable diagnostic and prognostic aid in acute surgical diseases that is furnished by any of the methods of blood examination. It is of value chiefly in indicating fairly consistently the existence of suppuration or gangrene, as evidenced by an increase of the polynuclear cells disproportionately high as compared to the total leucocytosis. The greater the disproportion the surer are the findings, and in extreme disproportions the method has

proved itself practically infallible." Dr. Gibson also describes a standard chart for the purpose of graphic illustration of the disproportion mentioned, and in the attempts to use the method as an aid in the diagnosis of suppurative conditions this chart will prove valuable. When introducing a laboratory method to clinicians it not only is essential to quote the practical results to be obtained and the existing errors, but also to cite a series of cases in which its usefulness is demonstrated. This is a difficult task for the laboratory worker and not necessary in this instance as the publications by GIBSON in surgery, TAYLOR in gynecology, and MCKERNON in otology are both clinically and technically explicit. Dr. MCKERNON's article, "The Clinical Value of the Differential Blood-Count in Operative Otology, read before the Surgical Section of the Academy on Dec. 20, 1906, and published in the *N. Y. Medical Journal* for Jan. 19, 1907, covers a larger experience with this method in his specialty than any other I know of.

I shall now endeavor to explain as far as possible the exceptions which have been observed in the use of this diagnostic aid and this will include a consideration of the few fallacies to which McKernon directs attention in his paper. It has generally been noted, as Dr. McKernon states, that inflammatory lesions confined to cellular bone structures do not show the high figures in polynuclear increase or leucocytosis seen when soft parts are involved, but the disproportion between the polynuclear percentage and the total leucocyte count is present, and this constitutes the important feature. Suppurative processes on the surface of mucous membranes or mixed infection with or following tubercle bacilli or typhoid bacilli present the same peculiarity. When purulent exudates are confined in dense pyogenic membrane or when they are the result of typhoid bacilli or tubercle bacilli without other organisms, there is no leucocytosis and no relative polynuclear increase. The exact nature

of the infection also has a bearing on the degree of polynuclear increase and total leucocyte count, some organisms causing higher figures than others, everything else being equal. It is a strange coincidence that almost all glaring exceptions which have come to my notice have been in hospital practice, and this creates the suspicion that the counts have not been properly made. While the procedure is a simple one, its routine execution is certainly monotonous, and we all know from experience of one kind or another how the hospital junior dislikes monotonous work. An improperly spread slide with a differential count made along its edge makes a short task but will lead to a ludicrous result in any case.

With the exercise of every precaution, however, a relatively very small number of cases is met with in which the examination does not reflect the true condition. These are usually patients with much reduced vitality and it seems reasonable to look to one of two causes for an explanation. Either the vitality is so low that absorption of toxin does not take place, or, on account of improper circulation, the drop of blood taken from the finger or ear does not represent the actual condition of the blood as a whole. It is probable that this is the reason why the method does not work out as well in infants and young children, particularly in those where prostration is extreme. If investigation proves the value of the Arneth count as an index of phagocytic power, it will be of particular value in these cases, but there is still considerable doubt as to its usefulness.

JOSEPH ARNETH in his book on *Neutrophilic Leucocytes* and in subsequent papers claims a difference in phagocytic power between the young and the older polymorphonuclear cells and believes that good phagocytic power exists only in the older cells which have three or more nuclei. His index of phagocytic power is obtained by learning the actual number of polynuclear cells with three or more nuclei in 1 *cmm*. This is done by determining the total

leucocyte count, the polynuclear percentage, and thus the number of polynuclear cells in 1 *cmm*. On counting the relative number of cells containing three or more nuclei, their actual number in 1 *cmm* can be figured. This index of phagocytic power is believed to be a valuable aid in both diagnosis and prognosis of acute infectious lesions. A number of articles have been written in support of ARNETH'S view, among others one by Dr. A. E. CHACE on work done in the Post-Graduate Pathological Laboratory and he considers it of decided use in prognosis. Numerous objections to ARNETH'S original hypothesis have also appeared and its clinical utility is still open to question. For the past year I have been making the ARNETH count in all specimens where it seemed indicated, and while considerable data has accumulated I am as yet not prepared to voice an opinion.

The claim of WRIGHT and DOUGLAS, that the opsonins in the blood are diminished in certain bacterial infections and that this diminution can be learned by determining the opsonic index, immediately suggested the use of this determination in the clinical laboratory as an aid in diagnosis and prognosis. The procedure is at best a very tedious one and the technic not yet sufficiently practical so that two workers can obtain anywhere near the same result, to which PARK also calls attention in his recent article in the *Journal of Medical Research*. These objections, together with WRIGHT'S statements that single observations are of but little value, that localized infections may show no deviation from the normal, and that in acute cases with systemic symptoms high index may alternate with low index, are ample evidence why this method is without value as a routine diagnostic aid.

In conclusion I beg leave to repeat, that laboratory methods, no matter how important, are aids only to the physician; they are not intended to replace his clinical diagnostic skill or his prognostic ability based on clinical experience.

THE VALUE OF BACTERIOLOGICAL INVESTIGATIONS IN OTOTOLOGY WITH SPECIAL REFERENCE TO BLOOD CULTURES¹

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THIS subject will be discussed particularly from the following standpoints:

1. Bacteriology of otitis media and its complications.
2. Significance of the findings; in this part attention will be drawn to the necessity of careful differentiation of the pneumococcus and streptococcus.
3. Results of blood-culture studies and their significance.

A few remarks are necessary regarding the technic of the primary examination. The secretion should be obtained directly after the drum membrane has been punctured, if possible. In all the series of investigations in which this has not been done there is an unusually large number of staphylococcus findings reported. Arrangement should be on hand for fixing the material for later capsule stains. A number of spreads should be made. If no bacteria are evident with ordinary stains the reserve specimens can be stained with dilute carbolic fuchsin. With it bacteria can at times be stained when other stains show no organisms. Tubercle bacilli can be looked for if it is thought necessary.

¹ Abstract of paper read before the Otological Section of the New York Academy of Medicine, November 8, 1907.

I shall not discuss the modes through which infection can reach the middle ear. The results of the cultures vary as to whether one is dealing with primary or secondary cases. In the latter group streptococci will be found much more frequently. The results also vary in acute cases and in chronic cases. There is a considerable difference between the results of the earlier and the later investigators. I shall cite some of the results from both groups.

One of the most important early investigators, Nadolieczny (1), reported 34 cases examined directly after puncture; the pneumococcus findings predominated. Hasslauer (2) has analyzed a number of cases from literature. Of 175 cases in which examinations were made directly after puncture, the pneumococcus was found 64 times (41 times in pure cultures), streptococcus 48 times, staphylococcus albus 16 times (15 times pure), staphylococcus aureus 18 times (15 times pure), bacillus pyocyaneus 5 times. In another group of 203 cases in which the secretion was examined after a number of days the pneumococcus again predominated.

Leutert (3) found in his studies of mastoid cases a predominance of the streptococcus. The sinus thrombosis cases number four, in all of these the streptococcus was present. He believes that sinus thrombosis is almost exclusively the domain of the streptococcus. In four cases of brain abscess he found streptococci four times, once pure and the other times mixed with other bacteria. In secondary cases of otitis media the streptococcus predominated. In chronic cases staphylococci were found very often. He believes that the chronicity may be due to the staphylococcus. Funke (4) studied a series of 76 cases and found a large number of organisms in his studies. He also found streptococci more commonly than pneumococci. In one case he found the influenza bacillus with the staphylococcus aureus. He reports more mixed infections than any other author. Hasslauer (2) studied

82 cases, 48 cases after paracentesis. In these the pneumococcus predominated. In 19 cases in which the study was made at a later time, the pneumococcus again predominated. In another series the pneumococcus was found 65 times.

I will now draw attention to a very thorough recent piece of work by Suepfle (5). He studied 100 cases. In most of his cases he obtained the streptococcus (60 %); the next most frequently found organisms were the pneumococcus (15 %), the streptococcus mucosus (14 %), and staphylococci (8 %). Pneumococci and streptococci were generally found pure. Staphylococci were found pure rarely. He believes that the clinical pictures are not found to correspond to the infecting organism so that the prognosis can not be made from the organism found, but he believes that the following conclusions are safe:

1st: Otitis media with staphylococcus secretion (these cases look more like tubal disease) will recover.

2d: Staphylococcus and pneumococcus infections rarely cause complications.

3d: In cases of infection by the streptococcus mucosus the chances are even for recovery with or without operation. The streptococcus mucosus seems to have a deleterious effect upon the bone.

4th: The origin, course, and duration of otitis media depend less on the virulence of the infecting organism and more on the general and local diseased processes.

Suepfle observed five cases of tuberculous otitis; in three of the cases other organisms were also present.

Wittmanck (6) made a study of the streptococcus mucosus in its relation to otitis media. He thinks that the streptococcus mucosus more often causes so-called primary otitis media than other streptococci do. In his 55 cases he found ordinary streptococci 24 times, the streptococcus mucosus 21 times, pneumococci 10 times. The streptococcus mucosus infections lasted four to five weeks, the streptococcus cases three to four weeks, and

the pneumococcus cases two weeks. Seventy-five per cent. of the mucosus cases developed mastoid disease. He believes that in cases of streptococcus mucosus infection the process is in the mastoid from the beginning.

Before I go on to my own data, I wish to refer to a summary given by Rist (7) of the work of the Veillon school concerning anaërobic organisms. Veillon and his students isolated by new methods a series of anaërobic organisms which had not previously been found. They include bacilli, cocci, spirilla, and spirochetes. They found that in processes in different parts of the body which were accompanied by a foul odor organisms of this group are generally present. Veillon and Zuber (8) studied 22 cases of mastoid suppuration, and in 21 of these 22 cases they found anaërobies. In only one case was there a pure pneumococcus culture; that was the only case in which a foul odor was not present.

Our own investigations we have grouped in two series. One series extends up to April, 1904, and comprises 89 examinations of ear discharges or complications of otitis media; the other series extends from April 1st, 1904, to November, 1907, and comprises 141 examinations. The former group I shall not give in detail now as I want to refer mainly to the latter group, because since 1904 we have made a more careful study of the organisms based upon the work of Dr. Buerger (9) on the differentiation of the pneumococcus, ordinary streptococci, and the streptococcus mucosus. In the 141 cases examined there was found the streptococcus in 88 cases (pure in 79), the pneumococcus 8 times, the streptococcus mucosus 10 times, staphylococcus aureus 4 times, staphylococcus albus 3 times, bacillus proteus once, pyocyaneus twice. In the earlier cases there were 4 cases of pyocyaneus infection, 5 by staphylococcus albus, and 2 by staphylococcus aureus. From this it is to be seen that our results resemble those of the latest studies, namely that the streptococcus is most frequently found (52 %),

and streptococcus mucosus next most frequently (8 %), and the pneumococcus (6.4 %) the least frequently of the three. Besides the organisms mentioned we have also encountered the following organisms: the diphtheria bacillus, the colon bacillus, Gram-negative cocci, xerosis bacillus, anaërobic organisms, and contaminating bacilli. In a large number of instances these organisms were found in variously mixed cultures.

In brain abscess cases we found streptococci 3 times (once pure), colon bacillus once, and proteus bacillus once. In 13 cases of sinus thrombosis we found streptococci 10 times alone or with other organisms; in the other three cases no bacteria were present. The series of cases of extradural abscess and perisinuous abscess is too small to be given in detail. Twenty-five cases of meningitis secondary to otitis media were studied. In 13 cases streptococci were found, in 4 cases pneumococci, in four cases the streptococcus mucosus, in one case the pseudo-influenza bacillus, in one case the influenza bacillus, in one case the colon bacillus, in one case the tubercle bacillus, and in the other cases the results were negative. It is hardly necessary to draw attention to the great value of positive findings in the lumbar puncture fluids in establishing the diagnosis of meningitis. Besides the organisms which we have mentioned above as having been found in our own series, the following have been found in cases of otitis media: meningococcus, the Friedländer bacillus, the oïdium albicans, actinomyces, gonococcus, tetragenus, bacillus lactis aërogenes, and a variety of saprophytes.

The work of the last few years, particularly that of Dr. Hiss and of Dr. Buerger, has shown the great necessity of more careful differentiation of pneumococcus and streptococcus. I will not go into the diagnostic criteria at present but will refer the reader to the important papers (10).

To add to the difficulties involved in the question,

it has been found recently by Dr. Buerger and Dr. Ryttenberg (11) that the pneumococcus can be so changed in the human body that it can be differentiated from the streptococcus only with very great care or not at all.

The streptococcus mucosus is an organism that has been studied carefully only during the last few years. It had been found by several authors in cases of otitis media, in meningitis, and in pneumonia. Dr. Buerger (12) reported a study of the organisms based on 12 cultures, 9 of which were from the normal throat. The fact that the difficulties of differentiating the organisms of this group has not been properly realized by a number of authors working on the bacteriology of otitis media will explain the difference in the results reported by different authorities. It is necessary that the bacteriological work on otitis media cases should be continued so that one can learn definitely whether or not the pneumococcus causes a less serious form of disease than the streptococcus.

When we go over the cases of sinus thrombosis in literature it is surprising to find that practically no cases of pneumococcus sinus thrombosis have been reported, although many organisms must have been reported as pneumococci in the otitis cases which were really not pneumococci.¹ It is, of course, possible that some of the streptococci which have been found in some of the sinus thrombosis cases were changed pneumococci, but it is necessary to establish this point definitely, for if pneumococcus sinus thrombosis cases are not found it will be a valuable thing to know whether an ear discharge is due to the pneumococcus or not. The examination of the discharge may at times be valuable in other ways—for instance, if meningococci are found in the ear discharge,

¹ Voss (*Monatsschrift fuer Ohrenheilkunde*, Bd. 38, 1904) is the only author who has reported cases of pneumococcus sinus thrombosis. In 18 cases of sinus thrombosis, streptococci were found six times, and pneumococci five times. Unfortunately the criteria used in identifying the organisms as pneumococci are not given.

one knows that the patient is suffering or is liable to suffer, from cerebro-spinal meningitis. Furthermore, if a blood culture is to be taken on a case of otitis media, it is very valuable to know what organism was found in the ear so that one can use appropriate media for the blood culture.

The value of the bacteriological examination of the cerebro-spinal fluids in connection with this work is self-evident. I might also note the value of the Widal reaction in connection with this work in cases in which the question arises as to whether the patient has typhoid fever or a complication of otitis media.

RESULTS AND VALUE OF BLOOD-CULTURE STUDIES IN OTITIS MEDIA AND ITS COMPLICATIONS (13)

There has been very little systematic work done on the bacteriology of the blood in infections of otitic origin. There has recently appeared an abstract of some work by Kobrak (14). According to the report which I have seen he had many positive results, but the abstract does not give information of a type that would be useful to cite in detail here.

We have made 75 blood cultures in 55 cases. Twenty-two of these cases have given positive results; 16 of the cases died and 6 recovered. Of the 16 cases which died, two were cases of streptococcus mucosus meningitis. The positive results have been almost entirely in cases of sinus thrombosis or meningitis.

In otitis media we have had two positive results, but in both of these cases there is no record of any examination of the jugular bulb. In cases of pure mastoid disease and extradural abscess, the results were negative except in one instance. In meningitis cases there were two positive results. As mentioned above, both were cases of streptococcus mucosus infection. In the cases of brain abscess that were studied, the results were negative.

Twenty-six cases of sinus thrombosis were studied;

17 gave negative results (9 of these patients died), and 9 gave positive results (of these, 3 died). All the positive blood cultures in these cases showed streptococci and the sinus itself showed streptococci, sometimes with other organisms. Blood cultures may be negative in cases of sinus thrombosis under a number of conditions. Some of the explanations are as follows:

1st: Bacteria may have escaped into the blood current and all may have been killed off. Possibly a blood immunity is acquired.

2d: Below the purulent clot there may be a non-infected clot, or an infected clot none of which breaks off.

3d: A bacteriemia may be prevented by tying the jugular vein. In such cases metastases (due to bacteria lodged early) may come some days after the blood is free from bacteria. All the foci in which bacteria have been deposited do not show activity at once.

4th: The patient may have sinus thrombosis; there may be secondary foci in the lungs, but the bacteria may not escape into the general circulation.

I will finally discuss the significance of negative and positive findings, but I will not at this time go into all the questions which come up in this connection.

SIGNIFICANCE OF NEGATIVE BLOOD CULTURES:

1st: If the mastoid has been exposed and there is no trouble in the sinus or brain, a negative finding will point against a continuance of the symptoms being due to a general infection. In such cases one may find that the patient has developed tuberculosis, may have rheumatism, or may have developed some other intercurrent disease.

2d: If the blood culture should be negative and the symptoms continue, whether there is a sinus thrombosis or not, acute endocarditis can be excluded.

3d: If there has been a sinus thrombosis and bacteria have been present in the blood and the jugular vein has

been tied, a negative culture will show that the general invasion has been stopped.

4th: Occasionally a negative blood culture has been of value in cases with a clinical picture of rheumatism coming on in a person who has otitis media or mastoid disease. It is very valuable in such cases to know that we are not dealing with an arthritis due to general invasion by known bacteria.

SIGNIFICANCE OF POSITIVE BLOOD CULTURES:

1st: A positive blood culture indicates a general invasion. A positive streptococcus blood culture in our experience nearly always points to the presence of sinus thrombosis.

2d: If the sinus has been operated upon and the patient is not doing well, a continued presence of streptococci in the blood shows that the local focus has not been sufficiently dealt with. If the local focus has been thoroughly dealt with, streptococci generally remain in the blood only when endocarditis has been established or when the bacteria are multiplying in the blood. The establishment of endocarditis in these cases occurs, according to our experience, quite infrequently. Multiplication of streptococci in the blood in such cases is also not frequent, so that a positive result continued after operation most often means that there is further trouble locally.

3d: If the streptococci have been present in the blood and the sinus has been explored and the jugular vein has not been tied, continued presence of organisms in the blood may give the indication to tie the jugular vein.

4th: If the infecting organism in the ear has been the streptococcus, and the pneumococcus should be found in the blood culture, the suspicion would be aroused that the patient was developing an intercurrent ordinary pneumonia.

5th: In cases in which there is a question as to whether

the patient has developed typhoid fever or a complication of otitis media, the presence of bacilli in the blood would prove that the patient had typhoid fever.

6th: In a certain number of cases in which the ear phenomena are very slight or in which one is not ready to trace marked clinical phenomena to an old otitis, the presence of organisms in the blood may give the indication to explore the mastoid and surrounding parts if there be no other focus found through which the bacteria could gain access to the blood. We have had three such cases which were operated upon, and in two sinus thrombosis was found and in a third mastoid disease. All the patients recovered. In a fourth case which concerned a comatose man, streptococci were found in the blood and there were metastatic foci present in the body. The only possible entrance point found was an otitis media. The patient was in too poor a condition for operation, but the autopsy showed that a sinus thrombosis was present.

These data are sufficient to show how valuable blood-culture studies are in otology. It is important to note that in no line of work are routine rules more disadvantageous in attempting to draw conclusions. Each case must be made the subject of a careful study. The points we have brought up in the course of the paper show the necessity of making bacteriological examinations directly after paracentesis in cases of otitis media, and in making examinations of the blood for bacteria in all unclear cases.

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A CASE OF MASTOIDITIS IN AN INFANT WITH SOME INTERESTING FEATURES.

BY JAMES F. McCAW, M.D., WATERTOWN, N. Y.

THE case forming the basis for this report was seen in consultation with Dr. C. N. Bibbins on July 8, 1907.

The patient, a male baby, five months of age, born of healthy parents, had not been sick. For several weeks the mother had suffered from a slight "sore throat" and on June 12th had a very pronounced follicular tonsillitis and pharyngitis. During this time she had been nursing the baby. For several days the baby had not appeared well; June 24th the mother noticed that he was restless, fretful, feverish, with a slight enlargement on the left side of neck and apparent stiffness in the muscles. Dr. Bibbins, the family physician, was called in at this time and made a diagnosis of acute pharyngitis with enlarged cervical lymph glands. The baby was treated with the ordinary antiphlogistic measures, when the symptoms of acute inflammation about the throat promptly subsided. The cervical adenitis, however, did not subside; on the contrary, it continued to increase until it had attained enormous proportions. The mass began to soften, and a few days before I saw the case, it was thought fluctuation could be detected. On the morning of July 8th there was a very profuse purulent discharge from the left auditory canal, which was the first direct indication the doctor had of the possibility of disease of the middle ear or mastoid. The temperature had varied from 99.5° F. to 103° F. for two weeks. At this time I was asked to see the case in consultation. The baby was well nourished and did not appear very sick. There was an enormous swelling involving the entire left side of neck and extending from the mastoid region above to near the external

extremity of the clavicle below. This mass was slightly reddened and distinctly fluctuating, but not especially tender to the touch. Deep pressure over the mastoid elicited doubtful tenderness; there was absence of oedema over this area. Examination of the canal showed a rupture in the posterior inferior portion, at about the junction of the middle and inner thirds, through which thick pus was oozing. Direct connection of this opening with the pus cavity in the neck was demonstrated. Pressure over the latter would rapidly increase the flow of pus from the canal. The drum membrane was intact, only slightly congested and not bulging. The entire posterior wall of the canal was of a dark purplish-red color, swollen, and showing the disintegration at the point of rupture above referred to. A diagnosis of probable Bezold form of mastoiditis was made and immediate operation advised and done the same afternoon. Under chloroform a free incision was made into the cervical mass, which was found to be made up of pus and broken-down gland tissue, about two ounces of the former being evacuated. After thoroughly curetting this cavity, search was made and the opening found passing into the canal, but even after extending my incision and stripping the mastoid of periosteum, no communication between it and the purulent focus could be demonstrated. Notwithstanding this negative finding, the antrum was opened and found filled with pus. Although the bone was only soft and not broken down, a typical mastoidectomy was done. The wound healed rapidly and was closed in three and one-half weeks. This broke down about one week later and roughened bone could be felt at the bottom of the sinus. September 20th a secondary operation was done. Since then the wound has firmly healed and the baby made an uninterrupted recovery.

There are several points of interest in this case. First: The history of several days' indisposition, followed by swelling below the mastoid, rapidly increasing in size, the absence of pronounced tenderness or oedema over the mastoid, with only slight congestion of the drum membrane appearing in a baby, all lead to a presumptive diagnosis of Bezold's form of mastoiditis.

Second: While others have reported the rupture

into the auditory canal of suppurating glands of the neck, it must, in my opinion, be quite infrequent.

Third: The question of relationship of the two pathological processes is very interesting to the writer. Are we to suppose that primarily there was an infection of the middle ear and mastoid antrum with subsequent involvement of the lymph glands; or did we have two independent processes; first, the direct infection of the cervical lymphatics and glands, from the tonsils and pharynx and later the middle ear and mastoid.

From the pathological findings at the time of operation, the writer is now inclined to the latter view. The reason for so thinking was the difference in the degree of pathological destruction in the two areas found at operation. The mastoid showed only an empyema without bone involvement, while the glands were in a state of complete disintegration.

I.—ROYAL SOCIETY OF MEDICINE (OTOLOGICAL AND LARYNGOLOGICAL SECTIONS).

Journal of Laryngology, etc., 1907, xxii., p. 421.

RECENTLY the majority of the various surgical, medical, [and special societies have amalgamated into the Royal Society of Medicine. In consequence the former Laryngological Society of London, the Otological Society of the United Kingdom, and the British Laryngological, Rhinological, and Otological Association no longer exist as such, but have been reconstructed in the form of the Otological and Laryngological Sections of **The Royal Society of Medicine**. All candidates for admission to either of the Sections have to pass the test of the ballot at the hands of the existing members of that Section, the conditions for eligibility for such membership being practically the same as those hitherto in vogue in the special societies.

The following are the list of officers of the new Sections:

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II.—EDUCATIONAL TREATMENT OF THE DEAF IN ALL THE STAGES OF IMPAIRED HEARING TO THE TOTALLY DEAF.

Journal of Laryngology, etc., 1907, xxii., p., 428.

IN discussing this question, LOVE emphasizes the importance of first determining the amount of hearing power in each individual case. Although it is very rare for deaf children to be entirely devoid of hearing, unless the remnant of hearing be within the speech area, it will be of no value in aiding teaching of the child. He subdivides his cases into (1) deaf-mutes; (2) semi-mutes, or children who have lost their hearing between the ages of three to ten years of age, and who have still a fair proportion of speech left; and (3) the semi-deaf, whose remnant of hearing lies within the speech area. The semi-mute

and semi-deaf form about twenty-five per cent. of all cases of so-called deaf-mutes. In their education no manual alphabet should be used, nor should any systematized sign language be employed. They should be trained by the oral method. In the mentally defective children, forming about ten to fifteen per cent. of deaf-mutes, the oral method is not applicable, and special education is necessary. Love considers the present eight years' system of intuition in Britain too short and suggests it should be lengthened to twelve years, and is of the opinion that every deaf child should attend the highest type of school from which it is likely to derive benefit. A strong appeal is made for the individual treatment of the deaf-mute child, and, whenever possible, that it should be given the chance of learning by the oral method.

HUNTER TOD.

III.—OBSERVATIONS ON THE DETERMINING CAUSE OF THE FORMATION OF NASAL POLYPI.

Journal of Laryngology, etc., 1907, xxii., p. 517.

YONGE agrees with the view that a mucous polypus of the nose is essentially, and in its earliest stage, a patch of mucous membrane which has become *œdematous*. He considers, however, that the initial localized œdema which occurs in the nasal mucous membrane, and which is the first stage of the process in question, is a serous infiltration of the tissues, the result of the obstruction of certain definite capillaries and veins—in other words, that the œdematous infiltration is due to an obstacle in the efferent circulation, which is in relation to the area in which the œdema occurs. This hypothesis is supported by experimental evidence on cats and by microscopical sections.

HUNTER TOD.

REPORT OF THE TRANSACTIONS OF THE SECTION ON OTOTOLOGY, NEW YORK ACADEMY OF MEDICINE.

MEETING OF NOVEMBER 8, 1907. DR. WENDELL C. PHILLIPS,
CHAIRMAN.

Presentation of Cases.

An operation for the correction of protruding ears. ARTHUR B. DUEL, M.D.

About a year ago I presented to this Section two patients on whom I had operated for protruding ears. Although the deformity in both cases was very pronounced, the plastic operation had differed from the usual one advised in such cases in that none of the cartilage of the auricle had been removed. The removal of a large elliptical piece of skin from the back of the pinna and scalp, suturing of the raw edges of the hiatus there made, had been sufficient to correct the deformity, drawing the ear back to the side of the head, at the same time making a fold in the cartilage corresponding to the antihelix, which improved its appearance instead of disfiguring it. The cases were called to your attention because they illustrated the possibility of correcting the most exaggerated cases of protruding ears without the necessity of cutting the cartilage or perichondrium, thus eliminating the danger of a possible chondritis and a consequent shrivelling of the auricle, a deformity much worse than that which the operation attempted to correct. Although the operation held the protruding auricle back in the position desired, it was somewhat unsatisfactory owing to the fact that the oval cut on the back of the auricle had to be so close to the border of the helix (in order that sufficient leverage might

be obtained to overcome the resiliency of the protruding cartilage) that the resulting sulcus behind the ear was very shallow.

For the purpose of overcoming this defect, at the same time avoiding the necessity of cutting the cartilage, I devised the following modification, analogous to Panas's operation for ptosis, the efficiency of which is demonstrated by the case I present to you to-night.

The skin on the back of the auricle is grasped by rat-toothed forceps at two points from $\frac{1}{2}$ to 1 inch apart and about $\frac{1}{4}$ inch behind the free border of the helix. By slight changes of the position of these forceps and dragging the auricle by them back to the scalp, the most advantageous points **for**, and the direction **of**, the pull necessary to correct the deformity are determined. These points are then marked by dark indentations made by a hard squeeze of the forceps.

Parallel incisions through the skin are then made, slightly longer than the distance between these marks, one at the post-auricular angle, the other about $\frac{1}{4}$ inch behind this. The skin is dissected up forming a thick loop.

Parallel lines are now cut from the points previously marked on the auricle to the anterior border of the loop. The resulting band of skin is dissected up to the points from which the traction should be made. Care should be exercised to avoid any injury to the perichondrium in this dissection. A pair of forceps is now passed under the loop, the band of skin grasped and drawn beneath it. Using this band as a lever, the loop as a fulcrum, the ear is now drawn back into the desired position.

It is necessary at this time to have the loop held down tight to keep it from stretching, and to spread the band to its full width by grasping the free corners with the rat-tooth forceps.

The desired position of the ear having been secured, the points on the band which come under the loop should be marked, as well as the distance from the posterior border of the loop to which the end of the band extends.

The band is now pulled out, and, being stretched over a small pad of gauze, superficially denuded over the area which is to lie under the loop. A quadrilateral piece of the scalp corresponding to the area which will be occupied by the end

of the band is now dissected out. The band is now again drawn under the loop, the denuded surface accurately apposed, and all edges united by interrupted sutures.

A thin pressure pad is placed over the line of sutures between the scalp and auricle, a generous one over the auricle, and a tightly fitting bandage applied. The dressing should be left on a week, when the stitches may be removed, and another pressure dressing applied, as before, for another week.

It is needless to say that asepsis is essential to success. It can readily be seen that this operation will correct the most exaggerated protrusion of an auricle without interfering with the cartilage, at the same time preserving the normal depth of the sulcus behind the ear.

In response to an inquiry from Dr. QUINLAN as to whether any attempt had been made to shorten the retrahens aurem muscle, Dr. DUEL replied in the negative.

Discussion. Dr. QUINLAN said that he had operated upon some cases of this character and found that they relapsed in a short time to the former cosmetic defect. In three cases he had attempted to shorten the retrahens aurem muscle, and in this way he had obtained a better result than by any post-superficial or elliptical incision.

Dr. DUEL said that in examining a number of these cases where there is a very marked protrusion of the ear one is struck by the fact that the natural folds of the ear are usually either very small in the upper part or entirely absent. In one case that he had shown there was no antihelix whatever, and, in performing the operation, instead of removing a portion of the cartilage and leaving a very large concha, the fold resulting from the retraction of the ear had formed a natural antihelix.

Dr. QUINLAN replied that in the cases he had seen the Darwinian tubercle was very well marked.

Papers.

The value of the leucocyte count in acute inflammatory disease. FREDERIC E. SONDERN, M.D. (Published in full in this issue.)

Value of the bacteriological examination in otological diseases. E. LIBMAN, M.D. (Published in full in this issue.)

Discussion.

Dr. GRUENING said: An overwhelming mass of hæmatological data has been presented by the two speakers. If in the diseases of the ear and their complications we were obliged to base our diagnosis on laboratory methods alone, we would find ourselves in a labyrinth requiring an Ariadne's thread to lead us out.

It is a good thing to have the use of the laboratory, and the assistance of such men as Dr. Sondern, Dr. Libman, and their co-operators to round off the work scientifically. In our clinical methods of examination we have generally a sufficiently safe guide for all practical purposes. At times, however, the results of bacteriological and hæmatological examinations are not only corroborative but become a determining factor in the diagnosis of disease.

In the case related by Dr. Libman, the patient had been brought into the hospital with symptoms of typhoid fever. Dr. Libman made a blood-culture and found streptococci in the blood. This fact, and the existence of an old perforation of the drumhead, led Dr. Libman to make the diagnosis of thrombosis of the lateral sinus. Dr. Gruening actually found the whole sinus thrombosed back to the torcular. This case is an instance in which the diagnosis was made by the acumen of the physician aided by bacteriological work. The otological data were insufficient for an operative interference. Dr. Libman's diagnosis in this case was a brilliant achievement.

Furthermore, the systematic study of blood-cultures in the laboratory of Mt. Sinai Hospital has taught him that if, in cases of sinus thrombosis, the **streptococci are found in the blood**, the condition of the patient is by no means desperate, because most of the patients in whom this toxæmia was found recovered after ligation of the jugular and removal of the thrombus. **In spite of all this brilliant work, he maintains that usually the clinical facts are sufficient to establish a diagnosis, and to indicate the proper line of treatment in diseases of the ear.**

Dr. McKERNON said that in the paper he had read last year, to which Dr. Sondern had made reference, he had stated that he regarded the value of the differential blood count in

otological work as simply confirmatory of the clinical evidence given by the patients at the time of operation. This opinion he still holds. In some doubtful cases the differential blood count had helped him to determine the conditions present which demanded operative procedure, and the histories of these cases were given in the paper. He was very glad to see that the results obtained by the workers in the laboratory confirm a statement made by him some two or three years ago—that we should not look for a high polynuclear percentage in bone cavities involved in a suppurative process; but if the adjacent blood currents are involved we may look for a high polynuclear percentage. In his experience—and this has been borne out by repeated examinations—the pus in a bone-cavity does not show as high a polynuclear percentage as in the soft tissues of the body. Later on, if the adjacent blood currents become involved, the polynuclear percentage is higher. This is also true of brain abscesses of the chronic type. He had seen only two cases of this variety, and in those the differential blood count was made several times and the polynuclear percentage was low—in one instance 74 and 69 in the other. Both cases containing pus and the abscesses were of the chronic variety, and had evidently been there for a long time. In acute brain abscesses you get a higher percentage owing to the increased absorption. Dr. McKernon said that he was very glad to hear Dr. Sondern allude to the discrepancies in the blood examination when made by different men. During the past few years he had had some experience along this line, and particularly when the examinations were made by the House Staff. In three or four cases in which he had been particularly interested, the examinations were made by the House Staff and also by the head of the laboratory and the discrepancy was striking.

Another point is that we get a lower polynuclear percentage where the patients show a low vitality, where the general condition is not up to par—there with a moderate degree of infection we get a low percentage.

Last year through the courtesy of an official of the Lying-in Asylum, the blood count of a number of pregnant women was made every day for ten days after their admis-

sion, and the differential count was much higher than it is in the average state of health.

Dr. McKernon said that he differed with Dr. Libman in one particular. Of course one case does not establish a rule, but in a case of his where smears from the ear were taken immediately after the ear was opened, Dr. Sondern had reported a staphylococcus infection. Eight days later the mastoid was involved and the pus examined, and this also showed staphylococcus infection. Five days later the patient showed evidence of sinus involvement. The sinus was opened and pus was found in it. The vein was ligated, and the pus which was present in the sinus and the coats of the vein all proved to have a pure staphylococcus infection, as proven later by cultures.

This is at variance with Dr. Libman's report in which he says he believes all sinus infections to be of a streptococcic nature. In all his other cases they have been of the streptococcus type. In all the 166 cases reported in Dr. McKernon's paper, the smear was taken in less than a minute after the incision in the drum membrane, so there was no possibility of any infection from without.

Another point of distinct importance is that where we have involvement of the sinus, where it is operated upon,—whether the vein is removed or not,—we should have daily examinations of the blood made to determine whether or not the infection is present, and whether it is increasing or diminishing. It is also of the utmost value in mastoid cases where there has been a large destruction of tissue, almost of the type of osteomyelitis, where the dura is exposed and large amounts of granulations found in the dura—there daily examinations should be made to show whether the infection has been checked or whether it is still going on to further involvement.

Dr. LIBMAN had not referred in any of his cases to the presence of the colon-bacillus. This had been reported in three or four of Dr. McKERNON's cases during the past two years. In closing Dr. McKERNON said that he was very glad to have heard both papers as they had brought out many points which he believed were of practical value.

Dr. DUEL said that he was surprised to hear no mention made of the important laboratory work on streptococci done

by Andrews and Horder in the Research Laboratory of St. Bartholomew's Hospital, London. In the light of their findings on the streptococci, one cannot help being struck by the inefficiency of our methods of examination of cultures and smears from middle ears and mastoids, and the impracticability of forming an opinion from them as to whether or not an operation should be done. Their work was done in accordance with some previous work by Gordon on streptococci taken from sputum. Gordon collected 300 specimens of streptococci from normal sputum, and out of these 300 specimens he was able by 9 differentiation tests to divide the 300 streptococci into 48 different species. This should make us realize that when we say a patient has a streptococcus infection we do not know much more the nature of his infection than when one says in answer to the question, "Why is that person lying on the ground?"—"A man knocked him down." In other words, the temperaments of the streptococci are as different as the temperaments of different individuals. Because one streptococcus has caused a certain lesion, it by no means follows that another streptococcus is going to cause the same lesion.

In their exhaustive paper Andrews and Horder had analyzed all their methods of work, and the manner by which they reached their conclusions, and their discussion of the subject was exceedingly interesting. With all their differentiation tests and allowing as wide variations as possible, they were only able to divide the general class of streptococci, including pneumococci, into seven different groups. These groups, however, were as different in virulence as is the strength of a lion from a mouse. In some cases the streptococci would form a local process like a furuncle; in another they would cause a diffuse inflammation like erysipelas; in another, would spread through the system and cause metastatic abscesses, etc. What then can be said about the presence of streptococcus in the absence of physical signs unless all of these differentiation tests have been made? He did not mean by this that the examination of a smear or culture is of no value, but because in a given case in the presence of streptococcus sinus thrombosis has supervened, one cannot argue in the next that without clinical symptoms the presence of the strepto-

coccus is likely to produce the same condition in the sinus. Even if one doubted the value of these differentiation tests, they were sufficiently startling to make one hesitate about placing too much confidence in simple smears or cultures.

Dr. SEYMOUR OPPENHEIMER inquired what were Dr. Libman's integumental complications in the presence of the bacillus pyocyaneus.

Dr. PHILLIPS said that he would like to ask two questions, perhaps somewhat remote, and yet worthy of consideration, pertaining to the remarks of Dr. Libman. One was the necessity of distinguishing whether each case of otitis media was primary or secondary. Dr. Phillips said that he was not sure just what was meant by primary and secondary otitis. As he understood the condition, it was with rare exceptions always secondary, and we should be very careful in making a distinction between primary and secondary. The other question related to the question of rheumatism. It seemed to him that Dr. Libman had clearly described a case of septic arthritis. This opened up the question as to whether articular rheumatism is not always a germ-infection.

Dr. DENCH agreed with Dr. Gruening, that we must rely mainly upon the clinical evidence in establishing a diagnosis. In certain cases, this opinion will be modified by the blood examination, and the latter is a valuable aid, but ordinarily the diagnosis will be made upon the clinical evidence.

Dr. DENCH then read some extracts from a paper presented before the New York Clinical Society last year, showing the value both of the differential blood count and of the bacteriological examination of the aural discharge, in cases of this character. Dr. Dixon had made for him a blood-count in 24 cases of mastoiditis, operated upon at the New York Eye and Ear Infirmary. All of these cases presented acute symptoms at the time of operation. The highest leucocytosis in an uncomplicated case was 25,200, with a polymorphonuclear count of 64.2. In this case there was very little mastoid tenderness, and very slight discharge from the ear. The mastoid operation was performed and the entire mastoid process was absolutely destroyed. The blood count was of absolutely no value in this case in arriving at a diagnosis. In

the other cases the leucocytosis ranged from between 6000 to 20,000. In no case did the polymorphonuclear proportion reach 80 %, in uncomplicated cases. In one case, which was complicated by a burrowing abscess of the neck, and later by a cerebellar abscess, the leucocytosis was 33,600, with a polymorphonuclear proportion of 84 %. In another case of double mastoiditis, complicated by suppuration of the supraclavicular glands, and later involvement of the lateral sinus upon one side, necessitating excision of the internal jugular, the polymorphonuclear count during the period of glandular involvement, was sometimes slightly over 80 %, while the leucocytosis ranged at various times from 17,000 to 30,000. In this latter case, when the glandular symptoms were present, and also when there was clinical evidence of involvement of the sinus, the polymorphonuclear count, as well as the leucocyte count, was high. At certain times, however, Nature seemed to mix enough added toxin to overcome the septic infection, and then the polymorphonuclear percentage became lower. Dr. Dench believed, therefore, that where there was an involvement of the soft parts or a general infection from involvement of a large venous channel,—such as the lateral sinus, that the differential blood count gave valuable evidence of the condition. In cases of simple mastoid suppuration, however, he considered that the differential blood count was of little or no value. In a case of double otitis media, with pneumonia, with some mastoid tenderness upon both sides, the blood count showed a high polymorphonuclear percentage, and it was suggested that the mastoid be opened on account of the high polymorphonuclear count. As there were certain pulmonary signs, however, operation was deferred, and the patient made a complete recovery without operation. We, therefore, see that the blood count may sometimes lead us astray unless all clinical evidence is carefully weighed.

Regarding the value of the bacteriological examination of the discharge, in these cases, Dr. DENCH reported 37 cases of acute otitis, occurring in private practice, in which a bacteriological examination of the discharge had been made. Out of these 37 cases, in 8 cases the smears were negative, indicating a very mild congestion of the middle ear, with effusion of serum. In 8 cases the infection was due to staphylococcus,

in 10 cases to streptococcus capsulatus, in 2 to latent streptococcus, in 3 to streptococcus—2 of these occurring as a mixed infection, 2 to pneumococcus and streptococcus, 2 to pneumococcus, and 2 to pneumococcus and staphylococcus. Out of these 37 cases, 7 came to mastoid operation. In two of these the infection was due to mixed streptococcus and pneumococcus infection. In one the discharge was not examined. In the fourth the infection was staphylococcus, in the fifth it was streptococcus capsulatus, and in the sixth the discharge from the ear showed streptococcus capsulatus. It should be stated that in the fifth case there was no discharge from the ear at the time of the diagnosis of mastoiditis; the bacteriological examination was made directly from the pus evacuated from the mastoid, and this showed streptococcus capsulatus in pure culture. In the seventh case the discharge from the ear showed mixed infection with streptococcus.

The consideration of these cases would seem to show that where the bacteriological examination of the middle-ear discharge is either negative or shows only staphylococcus infection, mastoid complications are not apt to occur. This should not be taken as an invariable rule, as he has seen cases of extensive mastoid involvement with a simple staphylococcus infection. Naturally, if we find a streptococcus infection we are more on the alert for mastoid involvement than if we have a staphylococcus infection. This rule, however, is but a general one, and has many exceptions. We should therefore consider that while the bacteriological examination of the discharge may be of some value in giving a prognosis, the evidence furnished by bacteriological examination should always be taken as secondary to the clinical signs present.

Dr. GREUNING says that he has never made a diagnosis of brain abscess upon the blood count alone. He can recall one case in which the only evidence that we had of brain abscess was that afforded by a high polymorphonuclear count. This case was seen by several consultants, and all advised delay. When the operation was finally performed, a large abscess was found in the frontal lobe. In this case, had the blood count been relied upon, the patient's life could undoubtedly have been saved by early operation.

Dr. DENCH believed that the differential blood count was of value in making a diagnosis in involvement either of the brain substance, the soft tissues, or of the lateral sinus and jugular; in other words, in a case of mastoiditis showing a high polymorphonuclear percentage, he would be inclined to believe that either the soft tissues of the neck were involved, that the sinus was involved, or that there was some involvement of the brain substance, rather than to attribute the increased polymorphonuclear count to mastoid involvement.

Dr. BUEGER said that he regretted not having been present when Dr. Libman read his paper, and his inability to discuss therefore the bacteriological points brought out by that gentleman; however he wished to say, in reference to Dr. Duel's discussion, that the work of Andrews and Horder was not as reliable as supposed.

He himself had done work along these lines some years ago, and had recently published a paper in which he discredited their work and had shown that we should almost entirely disregard their conclusions. In his own work he found that although streptococci could be divided into a number of classes according to their power to ferment various carbohydrates, it was necessary to employ the media favorable for the growth of the organisms, and this Andrews and Horder had neglected to do. At the present time we are not able to conclude that there is any relationship between the cultural features of streptococci and their pathological action in the human body.

In regard to the streptococcus mucosus, he thought that it was diagnosed too frequently in these days, owing to the fact that the diagnosis is sometimes made on spreads alone, sometimes without reliable culture media, and without the employment of reliable capsule stains. Some two years ago he had studied a number of stains of the streptococcus mucosus, and had shown how to differentiate it from the ordinary streptococcus, the pneumococcus, and the mucoid variety of pneumococcus. He himself believed that the organism must be put in a separate class. Its most marked characteristics are the peculiar nature of its capsule, its peculiar mucoid growth, the persistence of the capsule in the culture media, and its virulence for certain animals. Unless

we base our diagnosis upon a sufficient number of these data, we lack assurance that we are not dealing with either the pneumococcus or some peculiar variety of streptococcus. In view of this fact, he thought that all otologists should inquire very closely into the methods employed for diagnosis before accepting the bacteriologist's report as to the presence of the streptococcus mucosus.

Dr. DIXON said that he had listened with much interest to both the papers of the evening. All are familiar with Dr. Sondern's axioms, and as they become better understood they must be generally accepted.

Dr. Gruening and Dr. Dench had both spoken about relying upon clinical symptoms. He did not think that any one would be warranted in making a diagnosis of phthisis by looking at a man and listening to his cough. There are certain means at our disposal for making diagnoses and we must take advantage of them. We should examine the blood and the pus from the ear, and consider these in connection with the clinical symptoms, then make the diagnosis.

Dr. Sondern had spoken of the discrepancies that are found when blood examinations are faultily made. A blood smear should never be counted from the edge, but from the centre, as he points out.

There is no question about the difficulties attending the differentiation of streptococci and pneumococci. He had frequently found what he considered to be a pneumococcus on the first smear obtained from a canal where the drum membrane had just been opened, and later found what appeared to be a perfect streptococcus in the mastoid pus, which had been verified by cultivation frequently. Of course the matter has to be looked into very carefully in order to differentiate.

When all is said and done we certainly have one germ, very frequently present in the discharge from the ear, which is exceedingly dangerous and insidious—the streptococcus mucosus capsulatus. This is the most insidious germ we have to deal with in suppurative ear disease. Cases of otitis where he had found streptococcus mucosus which had continued as long as four to six weeks, were invariably bad. What happens is that the patient seems to be getting better, the

acute symptoms subside, the mastoid tenderness—if any—disappears, the patient may have no fever, a normal pulse, the hearing may improve, but the discharge continues. Operate on such a case at this stage, and the destruction will be found out of all proportion to the symptoms past or present. In one case of this kind (a patient of Dr. J. L. Adams), of about a month's duration, two of his colleagues were opposed to operation, but Dr. Dixon strongly advised it. Mastoid operation was performed next day by Dr. Adams. The mastoid cells were removed with a spoon and the dura was found exposed for $\frac{3}{8}$ of an inch. If the patient had gone on for another 24 hours without interference he would likely have had meningitis. We have not one, two, or three cases of this character, but many, and in every one of them met with at the Infirmary, in which the streptococcus capsulatus was present and the disease had existed for from four to six weeks (sometimes less), operation had revealed extensive bone destruction, no matter what the clinical symptoms were then or before.

Another point in regard to the streptococcus mucosus was that in looking back over his experience in the laboratory nearly every case that had been complicated with diabetes presented the mucosus capsulatus. The nature of the infection as revealed by the ear discharge, the count and character of the blood, are often quite as important as the clinical symptoms.

In regard to Dr. Duel's remarks, Dr. LIBMAN said: He can only emphasize what has been said by Dr. Buerger of the work done by Andrews and Horder, and previously by Gordon. The work done by Dr. Buerger and another piece of work recently recorded in *Virchow's Archiv* show that it is not wise at present to go far in the differentiation of streptococci. He agrees with Dr. Dench that one should not set the indication for opening up the mastoid according to what bacteria are found in the middle ear.

He wished to emphasize, however, the point that he made, that pneumococci have so far not been reported in the sinus thrombosis cases, and if such continues to be the experience, the pneumococcus will have to be looked upon as a less serious infecting agent (notwithstanding the fact that it

can set up meningitis; for streptococci do this just as often).

The literature agrees with the statement of Dr. Dixon that the streptococcus mucosus has a bad effect upon the bone. In our experience the severest cases of streptococcus mucosus infection have been in diabetics. He could not answer Dr. Oppenheimer's question as he had not followed up the wounds in the pyocyanus cases.

The classification into primary and secondary cases of otitis media, concerning which the chairman has asked, is a classification which he has found in all the papers dealing with the bacteriology of otitis media. There seems to be a group of cases in which there is no history of any previous trouble in the body and to such he can see no objection to the term "primary" being applied.

Dr. McKernon's case of staphylococcus sinus thrombosis is of great interest. We have encountered no such case, but we have found staphylococci apparently as the sole infection agent in cases of otitis media and mastoid disease.

He believed that he had said enough in the course of the paper which shows that bacteriological work is of advantage very often in connection with otological work, and so he could not agree with Dr. Gruening's view-point as expressed here this evening. While it is true, as he states, that more patients who have had sinus thrombosis and streptococci in the blood recovered than did patients who had sinus thrombosis without streptococci, an analysis of the figures develops some interesting facts. Of the seventeen cases without bacteria in the blood, nine died, and of the nine cases with bacteria in the blood only three died, but in three of the last group of patients that recovered, an exploratory operation which led to the patient's recovery was done, because streptococci were found in the blood and the ear was apparently the only primary focus. And in a fourth case the jugular vein was tied off because it was found that bacteria were still present in the blood current after the operation on the sinus. So that four of the six recoveries in this group can be claimed to be due, at least in part, to the bacteriological examinations.

Dr. SONDERN said that his object in speaking again of the differential leucocyte count, the total leucocyte count, and

the ratio between the two, is that they have a distinct value as a diagnostic and prognostic aid. Everyone knows of many instances where it has proved of decided use. It is not supposed to take the place of clinical investigation but it is claimed to be a help, and the point has been reached where we can look upon it as such in a great many instances. On rare occasions it may be misleading in a sense but on the whole it proved to be of great value and should not be neglected as a diagnostic aid.

MEETING OF DECEMBER 13, 1907. DR. WENDELL C. PHILLIPS,
CHAIRMAN

Dr. W. H. HASKIN presented **a case of nature's radical operation for mastoid disease.**

Dr. LEDERMAN said that he had under treatment at present a very similar case. In this instance the upper half of the dome and Schrapnell's membrane were gone, and cholesteatoma was present. This is the condition generally found in these cases. In this case the principal symptom was vertigo of a very severe character. There was no granulation tissue in connection with the cholesteatoma. Over the remnant of the malleus there was a little cyst protruding from the drum cavity. There was marked dizziness in this case and it is probable that the horizontal canal was encroached upon, and that this is true of most of these cases.

A case of mastoiditis in an infant, with some interesting features. JAMES F. McCaw, of Watertown, N. Y.

Discussion: Dr. DENCH said that he saw a very similar case last winter, and it was only fair to assume that the infection came first in the middle ear. The patient was a man 56 years of age, and had previously been to several hospitals. The involvement was very great. Both drum membranes seemed normal—one had a very slight amount of congestion, which could be accounted for by the changes due to inspection with the aural speculum. There was a peculiar dull appearance of the membrana tympani. On wiping off this membrane one did not see the bright red color usually observed, and this dull color convinced him that there was pus behind the membrane. An incision was made, and examination of

the pus gave a pure culture of the streptococcus mucosus. An operation was performed on the mastoid, and three days later the other side was operated. It was a pure Bezold. The glands are involved secondarily. It does not require very much inflammation to cause involvement there. He had a case under observation this winter where a mastoiditis ruptured through the posterior inferior wall of the meatus, and a diagnosis of mastoiditis was made. There, curiously enough, the germ was the streptococcus capsulatus. In the opposite ear the man had had trouble prior to the operation, and while he was in the hospital for the operation wound this other side was also kept under observation, and as much destruction was found there as in the other ear. These cases are not of frequent occurrence, but after all they are not so very uncommon.

Dr. BRYANT said that in his opinion in young infants the infection does not start in the middle ear as in the adult, but it slowly starts from the outside, from ulceration of the drum membrane and from collections of putrefactive material.

Dr. PHILLIPS said that his opinion coincided with that of Dr. Dench. In his opinion a suppuration commencing in the glands and going from there to the middle ear is a very rare occurrence. He had never seen such a case. The suppuration begins in the middle ear and goes to the external region.

Dr. McCaw wished to correct an impression which Dr. Dench seemed to have in regard to the case. He did not mean to convey the idea that he supposed the infection to start from the glands and from there go to the middle ear.

Dr. HARRIS suggested that Dr. Bryant give his reasons as the view he had just expressed was unique and radical. His own opinion had always been in accord with those of Dr. Phillips and Dr. Dench. He had seen cases where the middle ear was involved secondarily, apparently, to the canal, and the canal was filled with cholesteatomatous material or something of that sort, but this infection of the canal was the result of infection of the middle ear. He had seen three cases where the beginning was a glandular swelling, apparently a periostitis, and finally the mastoid was opened. So far as the history went, it was a secondary infection of the inner part resulting from invasion of the throat or nose.

Dr. JOHNSON said that it was almost impossible in obtaining the history of a case to determine whether or not there has been any trouble with the middle ear prior to any glandular infection. We all see cases where the mother's story is that the child has had no discharge of the middle ear, and yet the ears are found full of accumulations of dead epidermis, etc., plainly indicating that there has been previous ear trouble. It is sometimes impossible to get a correct history from the family, so that it would seem that an inflammation might at any time precede the glandular infection. It is a very common thing for a suppurating ear and the bacterial elements accompanying it to infect the glandular tissues of the neck—indeed, it seems doubtful whether an infection of the glandular tissue of the neck could travel up and get through the periosteum into the mastoid.

Dr. COBURN suggested that it be remembered that the mother had suffered from tonsillitis. The child may have had a tonsillitis, and subsequent infection of the middle ear,—in other words, a double infection.

Dr. McCaw replied that that was exactly the ground he took with the case. The mother had suffered with a follicular tonsillitis, during which time she was nursing the baby. The child subsequently became infected with an acute pharyngitis and ran a temperature of 99.5° to 103° , and the first thing noticed was the swelling in the neck, to which the mother called attention. The pathological process in the middle ear at the same time was nothing but an empyæma; no bone involvement. The glands were broken down and necrotic. There was an immense cavity, and a necrotic condition of the posterior inferior canal wall.

Dr. DENCH inquired what was meant by an empyæma without bone involvement.

Dr. McCaw replied that the bone was not carious, it was simply softened and congested.

Dr. DENCH replied that in a child of five years there was only one cell in the middle ear—the antrum.

Dr. McCaw replied that he had said the antrum was involved.

Dr. PHILLIPS said that for a considerable number of years the otologists have been doing what is known as the radical

operation for the cure of chronic purulent otitis media, and it would seem that those who have been operating extensively must have formed some conclusions regarding the relative value of the operation and its actual value—as to whether the results warrant the procedure. Another reason for presenting the subject in the form submitted for to-night's discussion was that at a recent meeting of the Ear Clinic at the Manhattan Eye and Ear Hospital there was an astonishing divergence of views expressed on this subject. He hoped the members and guests would discuss the subject with the greatest freedom, bearing in mind that the topic covered just one of the diseases—the radical operation for the cure of chronic purulent otitis media, not the complications outside of that.

(a) In view of its dangers and results, when is the radical mastoid operation indicated in persistent chronic otorrhœa?

(b) What are the results of the operation?

1. On life.

2. On the otorrhœa.

3. On the hearing.

4. On the cure of the underlying bone disease.

(c) What are the dangers presented by unoperated chronic middle-ear suppuration?

Dr. DENCH said that as he had been asked to open the discussion, he had requested his associate to go over his operating book with reference to this subject, in order that he might present the statistics of the operations of this character that he had performed.

When is the radical operation indicated in persistent chronic otorrhœa? The answer is contained in the question. The radical operation is indicated in every case of **persistent chronic otorrhœa**. One which resists all other methods of treatment must be operated upon radically if we expect to get a cure. The milder form of interference, ossiculectomy, of which he was once an earnest advocate, is good in a certain small proportion of cases. A case upon which he operated 15 years ago has remained perfectly dry, with good hearing, and in that case the result of the operation has been most satisfactory. Unfortunately, however, the large majority of cases of purulent otitis media will not be cured by this method; and this simpler method of operation should be restricted

to those cases where we are led to believe that the amount of caries is limited to the ossicles and chain and the external auditory meatus. The same is true of the simpler methods of treatment, such as irrigations, and the application to the tympanic vault of certain astringent or caustic solutions, etc.

But when the question is one of persistent chronic purulent otorrhœa, then there is only one way to cure it, and that is by the radical operation. Under certain conditions he does not advise the radical operation, on account of its effect upon the hearing, but at present he would not modify his statement, that in all cases of chronic persistent purulent otitis media the radical operation is the only method of cure.

What is the result on life?

His record shows 270 cases operated upon by the radical method. Of these 270 cases there were seven deaths. Two and a half per cent. occurred following the operation; 2 of pneumonia; 2 of meningitis, one had meningitis prior to the operation, and the other of meningitis after the operation; 1 died of cerebral abscess, 2 of cerebellar abscess. The second case was one that came into the hospital with acute symptoms complicating the chronic process. The radical operation was done, the cerebellar abscess was drained, and four days later the patient died.

In none of these could the death be attributed to the operation, with the possible exception of one, so that the mortality of the radical operation is very small. In other words, the patients would have died whether or not they had been operated upon. The two pneumonia patients certainly would have died. The brain abscesses, both cerebral and cerebellar, were latent, and not the result of operation, so that the mortality is reduced to less than $1\frac{1}{2}$ per cent.

The effect on the otorrhœa?

Of the 270 cases, 166 were cured.

In 33 there is a slight,

In 8 more a moderate, discharge.

In 63 cases the result is unknown.

The large proportion of these cases occurred in hospital practice, and as the cases which get well do not come back, it is certainly fair to assume that two-thirds of these cases were cured, and that increases the total number of cures.

On the hearing?

Unfortunately, the hearing results are the hardest to get at, for these cases do not return to the hospital and the hearing is not tested until the ear has been dry for a number of months. We have reports, however, of 111 cases in which the hearing was tested before the operation and afterward. In 99 of these cases the hearing was unimproved, or remained the same. In 9 cases it was fair, and in only 3 cases was it bad. In a little less than 3 per cent. of the cases was the hearing worse.

On the cure of the underlying bone disease?

This is satisfactorily answered by the statistics. If there is underlying bone disease, the otorrhœa is not cured.

What are the dangers presented by unoperated chronic middle-ear suppurations?

Dr. DENCH said that a few years ago he had given an account of chronic suppurative middle-ear disease taken from the statistics of the New York Eye and Ear Infirmary for 9 or 11 years, and it was shown that one case out of 88, or a little less than one per cent., suffered from some severe intracranial lesion—meningitis, sinus thrombosis, etc.

This is practically a fair estimate of the operation considered from the point of view of statistics. We occasionally cure meningitis and we have cured brain abscess. If you don't operate you may be sure that more than one per cent. will die. So far as figures are concerned, these figures enable us to deduce a pretty definite opinion on the subject.

Dr. HANAU W. LOEB (St. Louis) called attention to some new work which is being done by Bárány and Neumann in Vienna on the diagnosis of labyrinthine suppuration and post-operative sequelæ of the radical operation.

Dr. Dench had mentioned two cases of meningitis. Bárány found that quite a number of cases died after the radical operation, from meningitis or some septic process in the brain incident to labyrinthine trouble; and he worked out a scheme for making the diagnosis. He found experimentally that when ice-cold water was injected into the external auditory canal there was a horizontal nystagmus in the corresponding eye; and that when hot water was used for the injection the results were exactly the opposite—the nystagmus was in the

corresponding side during the injection, and when it ceased the nystagmus was on the opposite side. Working on this, they have been operating on the labyrinth and have reported practically all cases successfully treated, and post-operative meningitis following the radical mastoid has since then not occurred.

Discussion.

Dr. HARRIS said that he did not feel that Dr. Dench's statistics should go unanswered. The question was a very broad one and was worthy of a full discussion.

¶ About a year ago he had occasion to investigate some of the questions raised in the topic of the evening, and had read a paper on the subject before the American Otolological Society. At that time he gained a very different impression from the statistics of two of the special hospitals of this city than was given from the statistics presented by Dr. Dench. He hardly thought that Dr. Dench's statistics could be regarded as a fair average of the results of the operation as done by the large body of men, and it is only by considering that, that a fair answer can be obtained to the questions of the evening. He thought it was fair to question the correctness of Dr. Dench's answer that every case of persistent chronic purulent otitis media should be operated upon by the radical method. Many think that a certain amount of chronic discharge, pure and simple, without anything else, is not a sufficient indication for doing the radical operation, because there are distinct dangers in the operation, and uncertainties in the result. His investigations showed a much larger amount than $2\frac{1}{2}$ per cent. of mortality from the operations done here and abroad, and even $2\frac{1}{2}$ per cent. is not small. He could not now recall the statistics of the Manhattan Eye and Ear Hospital, but certainly there was a large number that died from the radical operation, and these were not out of proportion to the cases given in the German and French clinics. It is only fair to assume that many men are more inclined to report favorable than unfavorable results. As for the small number of cases that can be improved by ossiculectomy, many of the members present still agree with Dr. Dench's original papers on this subject, and are getting excellent results from the intra-aural methods of operation, and feel to-day that they

can get a much larger number of cures by these methods than Dr. Dench has given in his statistics of actual cures.

Dr. Dench had spoken of something like 66 per cent. of cases cured as an outside limit, which does not seem to be a particularly strong claim for the radical operation. Even that is larger than a fair average of the work done here and abroad. In his own experience he had seen a good many cases, but there is a very large number where there is a certain amount of otorrhœa for a good while after the operation. He still felt open to conviction as to whether the radical operation will give such a large number of cures over that of ossiculectomy. The records of ossiculectomy are not indicated in all cases, but it is not fair to assume that you are not going to get favorable results from ossiculectomy in a certain number of cases without trying.

In regard to the persistence of the cure: Among the cases which he has seen from time to time, both his own and those operated by others, there have been a certain number of relapses. No case can be spoken of as perfectly cured where there is any discharge remaining.

The operation is not free from dangers, both in regard to direct mortality and subsequent complications. In not a few cases we get imperfect drainage, and not infrequently convert an inactive process into an active one.

Dr. DENCH said that the 1 per cent. of which he had spoken was not mortality, but was the percentage that had suffered from intracranial complications. Many of the cases that were operated upon got well. In cases where there is a persistent otorrhœa there is liable to be one or other of the intracranial complications; and there was only one death in the 270 cases that could have been attributed to the operation.

Dr. HARRIS replied that he had said he did not think it fair to analyze the percentage of deaths following the radical operation without analyzing the corresponding percentage of those that died without the radical operation. It was his impression that the statistics of death following the radical operation showed as large a percentage, if not larger, than that given by Dr. Dench.

Dr. LEDERMAN said that dating as far back as 1899, at the International Otological Congress held in London, chronic

otorrhœa and its treatment had been an important subject of discussion. At that congress the question was asked—"How long would you wait before doing a radical operation?" and the answer was—"After all the methods of treatment which were thought proper had been tried and still the discharge persisted."

Dr. Lederman said that he himself was not doing as many radical operations to-day as some years ago. Taking three cases that he has had under observation during the last two years as evidence, he feels that much can be accomplished by careful local treatment. One of these cases was treated locally for four years by a conscientious colleague, and was finally told that no further good could be accomplished by local measures. This patient was a woman of highly nervous temperament, and the very word "operation" was a shock to her. She was referred to the speaker for an opinion, and on the first examination, finding middle-ear disease and caries in the attic and tympanic cavity, he told the family that he did not think much could be accomplished by local measures but that he would try the effect. The drum was gone, the incus had disappeared, and granulations existed. He removed what remained of the malleus, and curetted the cavity of the tympanum and attic. He watched the case for eight months, waiting for some complication to arise, but the result was an absolute cure. Not only did the suppuration disappear under the local treatment applied, but there was a re-formation of the drum membrane, and this in a woman forty-five years of age.

In another instance a young man had come to him from out of town with a persistent foul-smelling otorrhœa of ten years' standing. The ear was filled with granulation tissue and part of the malleus remained—the incus had disappeared. The mere touch of the probe in the tympanic cavity set the patient into a form of epileptic convulsion, and this happened two or three times during the course of treatment. This case also healed entirely after a few months of local treatment.

The third case was a woman in whom the indications for operation were distinct. The discharge had existed for years. Diseased bone could be felt with the probe in the attic and ossicles. It was suggested that if the case did not progress

favorably within a short time the radical operation should be performed. The small perforation in the postero-superior quadrant was opened, the malleus and incus were removed, and under curetting and dry treatment a cure resulted in this case in which he had great doubts of the ultimate result from local measures.

We should not accept the broad statement that persistent cases of chronic purulent otorrhœa, without complications, should be operated upon, without giving careful local treatment a thorough trial. The radical operation is not a simple one by any means. When we see cases that even in expert hands result in facial paralysis and meningitis, we should bear in mind that we are dealing with an operation that carries its area very close to important structures. In two of the speaker's cases the lateral sinus appeared very close to the posterior canal wall and the dura dipped down over the antral roof, making the manipulation of the cavity very difficult. From the literature of to-day he is inclined to believe that conservative surgery in these cases is again coming into vogue. At the congress referred to Professor MACEWEN remarked that it was not good surgery to scrape away all the granulation tissue present, in operating for brain complications of otitic origin, for that is nature's barrier to infection. By exposing raw surface in this septic field we destroy this protecting agency.

Dr. N. L. WILSON said that he had come to the meeting to-night hoping for light upon the subject of when the radical operation is indicated. Last January a man came into his office for an acute condition of one ear, and he found that the other ear was discharging also, but the patient said: "Don't touch that ear; that has been discharging for 40 years." There was a bad odor from the pus, but no tenderness. This had continued for 40 years, and the patient would not let the doctor do more than look at it.

He had thought, and Dr. Dench had made it pretty plain, that all of these cases of chronic otorrhœa which do not get well under ordinary treatment should have the radical mastoid operation. Unfortunately, however, he has had three cases which died after the radical operation, which he feels would not have died had he left them alone. In other words,

the operation stirred up something which resulted in death. The three died of abscess of the brain. In one of them it is barely possible that there was an abscess before the operation, but the patient did not die for two months after the operation.

It is very important to know when to touch these cases and when to let them alone. Regarding the otorrhœa, that is generally cured. He thought the hearing was seldom improved, was frequently quite as good, and often worse.

Dr. MYLES said that in his opinion the subject was the most important one that could be brought before the Section. It is very easy to hold an experience meeting, but it is difficult to discuss the matter until we have more definite statistical data, and until we have adequate statistics upon the subject, our efforts to reach a conclusion will be futile.

He is a strong advocate of not disturbing the protective phagocytic wall which nature places between the meninges and the diseased mastoid cavity. In the last few years he has operated upon a number of mastoids where the meninges of the brain were found exposed and covered with granulation tissue; only moderate and careful curettage was used and the patients all made uninterrupted recoveries. He has tested the same treatment in the sphenoidal sinus many times and it was astonishing to note how nature came to the rescue of these pathological conditions.

The results obtained by free ventilation and free drainage of the accessory sinuses of the upper respiratory mucous membrane tract are really astonishing. Dr. Myles said that he had been very fortunate in his radical operations; he has always been careful when curetting the inner walls of the cells, and tried to avoid the exposure of the meninges and the brain when performing the radical operation. There is danger also of puncturing with the chisels and gouges, and he now uses the curette more and more and uses it more cautiously. He believed that there was more danger of infecting the intracranial structures when there are acute attacks in chronic cases than in the chronic cases. He was pleased to hear Killian say that he had discontinued doing his radical frontal sinus operation on acute cases. Killian said that if he had an acute frontal-sinus operative case he would make

a small hole for drainage and do the radical operation a few weeks later.

The cases with catarrhal discharges are different from those which show evidences of necrosis or cholesteatoma; in the latter class the process is liable to destroy the bone and penetrate to the brain cavity. We have the catarrhal conditions in the nose by the thousands and rarely have a death resulting from them. The necrotic type is always dangerous and should be operated upon.

He endorsed Dr. Dench's ideas in regard to a purulent and fetid otorrhœa where it is evident that the discharge comes from beyond the antrum, but felt that in the milder cases the line of advance will be made by better drainage through the wall of the external auditory canal. At present he does not know of any instrument which will remove this wall satisfactorily.

Dr. Myles said that the point he wished to make was that the otologist should in certain cases follow along the line of the general surgeon; in dealing with the pus cavity the surgeon does not remove all of the walls of the cavities in appendicitis, pleural or joint abscesses, but drains them. In the mastoid we have a pus cavity and behind one wall of the cavity there are the very important intracranial tissues. By following out this radically conservative treatment some very brilliant results may be obtained without increasing the risk of surgical infection of these intracranial tissues. He thought the most reliable statistics in regard to discharging ears were those of the insurance companies.

Dr. PHILLIPS said that the trend of life-insurance companies was tending toward accepting reasonable risks. One of the large companies had recently accepted an applicant who had had a chronic discharge for thirty years. The discharge was slight, perforation large, and no evidences of bone necrosis.

Dr. VOISLAWSKY inquired whether the radical operation is at all indicated in persistent chronic otorrhœa that is not purulent. With the exception of Dr. Myles no one had spoken of this point. He would also like to know if all of Dr. Dench's cases were purulent.

Dr. PHILLIPS replied that the question as put in the pro-

gramme had reference entirely to the purulent form of chronic otorrhœa.

Dr. BERENS said that he had come to listen to the discussion and was very glad that he had come, for he had learned much. All knew Dr. Dench to be a careful, and if not altogether a conservative operator yet one with extremely good judgment and an almost perfect technique. His results are excellent. He teaches, and teaches with a great deal of justice and sense, that we should operate on all cases that have withstood a sensible, sane, and conscientious treatment of chronic suppurative otitis. His results almost speak for themselves. When printed for the benefit of the profession at large, however, his results should be qualified by the statements made by Dr. Richards. He wished to thank these two gentlemen for their work. A thorough, complete, conscientious operation is seldom followed by death.

On the other hand, the remarks made about the protecting granulation tissue do not hold good in the hands of a careful surgeon. Dr. Richards's remarks about the complications of the labyrinth were very apropos. Some of these cases of brain abscess occurring two or three months after a radical operation may properly be attributed to labyrinthine disease which has extended. If the abscess was chronic at the time of the operation, such cases should not be added to the statistics of fatalities from the operation. He wished to emphasize Dr. Richards's statement that if we remove the focus of disease in every part we will practically always get a cure.

Dr. BRYANT agreed entirely with Dr. Dench and Dr. Richards in principle, but took exception to their list of possible means of avoiding the "radical operation." He said there was an important step which these gentlemen had not mentioned, which Dr. Myles had alluded to, namely simpler and less extended operations on the mastoid antrum by which the maximum of hearing is restored to the patient with a minimum of surgical risk. The operations which accomplish this are either a simple antral drainage, or a more extended operation which still concerns the tympanic structures. Dr. Bryant stated that these less extensive operations had a very

short convalescence and no fatalities and restored the hearing to practically normal if the tympanic contents were not already lost, and that they stopped the otitis media, and that therefore there was not further need of recourse to the "radical operation." Dr. Bryant further stated that he no longer did the "radical operation" unless it was demanded by the patient or consultant.

Dr. JACKSON (Pittsburg) said that he had come from Pittsburg to learn something on this subject. He had learned a great deal and would like to hear more.

Dr. THOMSON said that Dr. Harris had expressed his views on the subject. The results that he has seen have been very discouraging, and while Dr. Dench with his perfect technique reports only 60 per cent. of cures, many have less favorable results. He thoroughly agrees with Dr. Richards in regard to skill in technique having a direct bearing on the question, but that is always a comparative question. Every one cannot have the same skill. Another point is that in thoroughly removing every focus of infection we enhance the probability of a speedy and permanent cure, but he could not see how the removal of minute areas of bone would influence the onset of meningitis inside of two weeks, as it is well known that up to that time the cavity is always an infected one, regardless of the skill used at the time of operation.

He had often thought that if the cases received the same amount of attention before the operation—daily treatment and careful observation for two to six months—as large a proportion would be cured as are now cured by the radical operation. He is convinced that we would get much better results if before proceeding to operation the patient was treated daily or every other day for a prolonged period.

Considering the fact that the mortality in operated cases is higher than that resulting from intracranial complications in unoperated cases, and the uncertainty of permanent results in the hands of most men, he considers that one proposing to a patient the radical operation assumes a very grave responsibility.

Dr. PHILLIPS said that all operators should obtain a definite history of every case and study the character of the case in all its phases before attempting to operate. The operator

should depend not only upon his own observation as to the appearance of the ear, the smell of the discharge, etc., but should have a history of the symptoms that have appeared in the case for six months or a year previous. In one instance he had operated upon a case which resulted fatally from an abscess which was presenting no marked symptoms at the time, and while this would have resulted fatally eventually, the operation did hasten his death.

There is no question but that in pre-existing abscess of the brain the operations that we perform hasten the death. Recently a case was operated upon in the Manhattan Eye and Ear Hospital by the radical operation for otorrhœa, which resulted fatally in six or seven days, and the autopsy revealed an old cerebellar abscess. There is no doubt but that death was hastened in this instance.

Dr. Phillips said that he did not wish it to be understood that he does not believe in the radical operation, for he does most emphatically believe in it, but such cases should be very carefully selected and only the more serious ones should be operated upon. If there is reason to suspect a pre-existing brain abscess it should, if possible, be determined, and the abscess and the ear should be operated upon at the same time. It is probable that, in many cases of localized meningitis where the patient has lived for years, the blows of the hammer and the manipulations of the operation excite anew the activity of the meningitis which otherwise would not have proved fatal. He felt that the profession has been too prone to resort to the radical operation without taking into full consideration its seriousness and the results which have been obtained from it. Some of these unfortunate results are seen in private as well as in hospital practice.

Dr. DENCH, in closing the discussion, said that so far as the relative dangers of the radical operation and ossiculectomy were concerned, while it is not infrequent to have a temporary facial paralysis follow the radical operation, it is seldom permanent. When facial paralysis results from ossiculectomy, it is generally permanent. In the 270 cases reported there was only one permanent facial paralysis. In regard to life—he would leave it to any one to say which was the wiser,—to do an operation upon a cavity which is compara-

tively closed, shut off by firm bony walls, or to operate upon an open cavity where you can see what you are doing. That is why he does not do more ossiculectomies at the present time. So far as safety is concerned, the radical operation is much safer than the other. Deaths have resulted from ossiculectomies.

A subsequent discharge from an ear subjected to the radical operation, does not always mean that diseased bone is present. In many of these cases, the operator has failed to make a meatus sufficiently wide to properly and permanently drain the large operative cavity. With a large radical cavity and a small external auditory meatus, epithelial detritus will invariably accumulate in the cavity, and when this accumulation becomes excessive, will cause a desquamation of the entire radical cavity. This desquamation depends upon two factors: the first is, that the meatus is too narrow; and the second is, that the newly-formed epidermis lining the cavity is unaccustomed to its strange habitat, and is unable for a considerable period of time to perform properly its functions. Experience shows that desquamation of the radical cavity occurs less and less frequently, as time goes on, and that finally these cases become completely dry, provided the external auditory meatus is of reasonable size. All that is necessary to do in these cases, is to thoroughly sterilize the radical cavity by means of an alcoholic solution of bichloride of mercury, and the insufflation subsequently of some bland dusting powder. Epidermization quickly follows, and the cavity becomes dry. The point to be borne in mind, however, in every case, is to make a large external auditory meatus, so as to ensure sufficient drainage and perfect aëration of the cavity.

He did not agree with Dr. Myles as to the danger of exposing the brain. He exposes the dura either over the sinus or middle fossa with perfect impunity. He agreed with Dr. Myles in regard to the granulation tissue. He generally takes off some, but not all. In dealing with granulation tissue one must use a certain amount of judgment and take away the soft tissue but not the firm layer. That should be left in place.

MEETING OF JANUARY 10, 1908. DR. A. B. DUEL, CHAIRMAN.

Presentation of Cases.

A case of streptococcus encapsulatus aural infection and modified radical mastoid operation. By W. SOHIER BRYANT, A.M., M.D., New York.

This case is interesting to the general practitioner because the mastoid operation was performed and the hearing improved in an old man, and also because in the absence of all the "classical" symptoms extensive involvement of the temporal bone was found at operation. From the specialist's viewpoint the case is interesting for the foregoing reasons, but especially so because we had to deal with a streptococcus encapsulatus infection; because the modified radical operation was performed; because a modified blood clot was used; because the blood clot, owing to faulty technic, "melted" out; and because there was no occasion for packing.

The patient was a man 65 years old. His aural trouble began 16 days previous to the operation with pain in his right ear, no discharge. On the tenth day before operation he entered the New York Eye and Ear Infirmary and became a patient of Dr. Robert Lewis, Jr. He appeared pale, fat, flabby, and older than his years should indicate. He had no discharge and no pain, but pressure on the mastoid tip showed extreme tenderness. The fundus of the canal was somewhat narrowed and the membrane bulged posteriorly. Temperature 100°; pulse 74; respiration 20. Myringotomy was performed and streptococcus capsulatus was found. Patient was put to bed and was given a cathartic. A fluid diet and aural irrigation were prescribed. The next day he had no pain but a profuse purulent discharge. Temperature 99°; pulse 62; respiration 20. On the following day, eight days before the operation, he had pain in head and ear and a profuse purulent discharge. The temperature sank to normal and remained there until the operation. On the sixth day before operation, little discharge, no pain. Up to the operation there was slight discharge, normal temperature, no earache, and occasional headache. Dr. Lewis decided to do the mastoid operation, inasmuch as the ear did not clear up

discharge from the lower angle of the wound. Eighth day, meatus dry, neck better. Tenth day, considerable connective tissue sloughing in wound. Twelfth day, patient left hospital. Practically no pus from wound. Cavity in wound not yet filled with granulations. Still connective-tissue slough. Seventeenth day, drain was omitted. Watch heard on slight contact with auricle. Nineteenth day, Valsalva inflation goes both through ear and through wound. Twenty-first day, watch heard at 1". Twenty-second day, wound practically closed. Patient feels well. Watch heard at 2 inches. Valsalva blows through wound. Twenty-fourth day, watch heard at 3 inches. Twenty-eighth day, watch heard at 4 inches. Forty-second day, operated ear heard watch at $5\frac{1}{2}$ inches; other ear at 6 inches. Two hundred and nineteenth day after the operation; linear scar and depression behind ear. Watch heard at 19 inches by operated ear; by other ear, at 14 inches. No tinnitus. The patient stated that previous to the mastoiditis the hearing was not as good in the operated ear as in the other.

Summary: This case is one of streptococcus encapsulatus infection and mastoiditis. The indications for operation did not include any of the classical indications, in spite of which very extensive destruction of bone was found. A modified radical mastoid operation was performed to remove the greatest possible amount of bone about the middle ear with conservation of the sound-conducting mechanism. A modified blood-clot dressing was used to facilitate primary healing and the best cosmetic results. The blood clot was lost through faulty technic. A cavity in the wound resulted, preventing primary healing. Granulations followed and the convalescence was prolonged a week, in case of primary union, to twenty-two days. A slight depression of the field of operation, resulting from collapse of the cavity left after the loss of the clot, appeared. In spite of the loss of the clot, packing of the wound was not necessary. At the same time, closure of the wound was a benefit in securing a better cosmetic result; the postaural scar caused only a slight unevenness of the surface, a shorter convalescence, and less discomfort from tedious packing, than if the wound had been kept open and packed. The modified radical permitted the removal

of sufficient diseased bone and the establishment of ample drainage, at the same time conserving the middle-ear sound-conducting mechanism, which preserved the hearing and even increased the habitual capacity of the patient. In chronic middle-ear catarrhs when the hearing distance is below 50 % of the normal, I expect that the post-operative hearing will be as good, and in some cases even better than before. This case is no exception.

Conclusions: The modified radical is preferable to the Schwartz-Stacke operation for the preservation of hearing and for the cosmetic results. The modified blood clot may "melt" away without seriously complicating the convalescence or prolonging it beyond 22 days. Packing is not necessary even when a blood clot has broken down. Poor hearing from chronic middle-ear catarrh may improve after a mastoid operation.

On previous occasions I have shown you cases that made short convalescence from 7 days up. I feel that it is interesting to see the result in a case with a slow convalescence.

Dr. WHITING inquired whether it was not Dr. Bryant's custom, in completing the mastoid operation, to cut off with the scissors the lacerated portion of the tendon of the sterno-mastoid. He had said that this becomes infected and sloughs.

Dr. BERENS wished to know what Dr. Bryant meant by the modified radical operation.

Dr. GRUENING said that this was a case of acute mastoiditis, and inquired whether it was not common to preserve the hearing in such cases. In an ordinary mastoiditis the ossicles are not removed.

In regard to the germ of the streptococcus capsulatus, his records at Mt. Sinai showed that the cases where this was present showed extensive destruction. Accordingly there would seem to be something in the claim that the streptococcus mucosus capsulatus does destroy the bone more rapidly than the ordinary streptococcus.

Dr. Gruening also said that what Dr. Bryant meant by the modified radical operation and the modified clot was not clear to him, and he would like to know what was meant by these terms.

Dr. DENCH said that the result obtained in this case was

very interesting. In acute mastoiditis one ordinarily gets very good results, as far as the hearing is concerned. He had seen a number of cases of acute mastoiditis, occurring in patients where a former chronic non-suppurative inflammation had greatly impaired the hearing. In these cases, the hearing after the mastoid operation was not infrequently better than before the onset of the acute trouble.

He had seen many cases where the streptococcus capsulatus was present, and while in some of them the most extensive destruction of the mastoid had resulted, yet many of them had not come to operation but recovered completely after incision of the drum membrane and free drainage. He did not therefore think that, given a pure streptococcus mucosus capsulatus infection, one is necessarily warranted in going into the mastoid earlier than in a case of simple streptococcus infection. On this point he is at variance with many of the men. Some time ago he had reported before the Society 11 cases of streptococcus infection only a small number of which came to operation. These cases occurred almost entirely in private practice. Given a streptococcus capsulatus infection of the middle ear, if it is drained freely through the membrana tympani the result is as good as with any other infection.

Dr. GRUENING said that at the present time the bacteriologists of Mt. Sinai Hospital examine the pus both after paracentesis of the drumhead and after the mastoid operation. In the cultures taken from the external auditory canal they obtain mixed results very frequently, but that does not change the result of the bacteriological examination from the mastoid itself; where, in the mastoid itself, the streptococcus capsulatus was found the destruction was generally very great.

Dr. DENCH said that the examination of pus from the mastoid, at the time of operation, could hardly be considered to possess much prognostic value. Extensive destruction of the mastoid may occur not only as the result of streptococcus capsulatus infection, but also as the result of any infection. He, personally, had seen extensive destruction after a simple staphylococcus infection, although these cases are rare. In the cases where smears had been made from the discharge from the external auditory meatus, in only a very small

proportion of cases was there a mixed infection. In those cases where the predominating germ was staphylococcus, he had naturally considered the possibility that this did not represent the middle-ear infection, but that the germ came simply from the canal. In those cases, however, where an examination of the aural discharge revealed only streptococcus capsulatus, he thought it quite certain that this finding must represent the germ causing the infection, as streptococcus capsulatus is practically never found in the canal, and also is never found there unless mixed with other organisms. In those cases, therefore, where streptococcus capsulatus alone was found in the aural discharge, it was only fair to assume that this germ was the cause of the middle-ear infection, and was not present adventitiously.

Dr. BRYANT, in closing the discussion, replied first to Dr. Whiting's question by saying that he always tries to trim off the tendon ends and get them fairly smooth, but he tries harder to remove the periosteum intact and leave no ends. He had operated upon the case in this way and, beginning at the tip, he had removed the whole process with the rongeur.

Replying to Dr. Berens's question in regard to the modified radical, he said that he stops at the annulus, opening the attic as much as possible and removing the outer wall of the attic and the anterior wall of the antrum, taking away as much bone as in the radical operation excepting in the middle ear. He takes down the entire posterior bony wall, excepting the bridge, but leaves that in order that it shall support the drum membrane.

To Dr. Gruening Dr. Bryant said, in regard to the post-operative improvement in hearing, he had no more accurate data than the man's statement that before the operation the ear operated upon was the worse but that now it is the better ear. A pure culture of the streptococcus capsulatus was found in the mastoid antrum at the time of the operation.

The modified blood clot is obtained by allowing the wound to fill with blood. A small drain is, however, inserted at first and soon taken out. The advantage of the modified blood clot over the simple blood clot is that it is more apt to go on to rapid healing by virtue of the drainage.

Dr. DENCH said that one should not operate earlier in

streptococcus encapsulatus infections than in any other infection. This case shows this infection justifies apparently early operations. This patient showed no classical symptoms of mastoiditis. Dr. Bryant had not seen the case before Dr. Lewis had requested him to operate. The patient had been in the hospital for ten days, had a normal temperature for a week. No one suspected a serious infection, but the operation disclosed extensively involved cellular structure.

“Do certain ear diseases tend to lateralize to the right or left?” B. ALEXANDER RANDALL, M.D., Philadelphia.

Dr. Randall said that he had been attracted years ago by the claim of Loewenberg that chronic catarrhal deafness is prone to affect first and worse the left ear in men, but the right ear in women. Confirming this by some statistical study, he had collected data in general as to lateralization of ear-disease and would venture a preliminary report as to his findings and impressions. Such study might eventually prove of distinct importance as to the etiology and treatment. Thus in furuncle, noting the greater frequency on the right in men (55-45%), he had ascribed it to abrasion by the right hand, and thus had been led to urge prophylactic treatment of the itching eczematous conditions however slight.

In his tabulation of the last 9000 cases at the Dispensary of the University of Pennsylvania, small support was given to some of his contentions, and some results appeared distinctly contradictory; but some of these were readily shown to be apparent only. Thus in o.m.c.c. these figures showed unilateral affection (sometimes with suppuration, etc., masking the condition of the other ear), whereas Loewenberg wrote of the ear which was first and worse affected. Taking the findings as to this from the last 2500 cases of his private records, he found among 451 patients a quantitative lateralization to the left in 65% in men (47:85), and to the right in 59% (129:91) of women. In 352 cases of unequal involvement in both sexes and all ages, there were 179 right to 183 left—practical equality; so the discrepancy in the sexes seemed significant. Of 1526 chronic suppurating cases at the Dispensary, there were 187 right to 207 left among men, and 102 right to 130 left in women; a preponderance to the left

in both which the smaller group of private cases rather supported. Yet he was hardly willing to renounce the impression that here too men differed from women, with a tendency to left-sided discharge while the women had right-sided.

Of acute tympanic inflammations, the table showed a less preponderance of right-sided catarrhal cases in men and left-sided in women than his observation indicated as usual; and the figures showed a consistently greater frequency of acute suppuration on the right among women only; but he would still claim that the right-sided affection is decidedly the rule in men, especially in the cases going on to mastoid empyema and caries. Thus of his last few hundred mastoid operations, 61 % of the acute were on the right, and but 42 % of those in chronic suppuration. Koerner claimed that the serious intracranial complications are more frequent upon the right, where the usually larger sinus penetrates more deeply into the mastoid; but the larger collections of cases rather contradicted his contention. Of internal-ear affections, the majority were bilateral; but of the one-sided, the left predominated, especially the Ménière cases.

The causes of lateralization of disease he sought in anatomical differences, such as the aortic configuration which makes embolism easier on the left, as well as in more local structure. For the catarrhal cases the nose must generally be responsible, and he had noted the left as being commonly the narrower naris, especially in men. This would apparently leave the right ear more open to infection, but make the left less capable of undergoing resolution, the apparent exceptions often showing compensatory deviations farther back, which count for more pathologically than more evident anterior anomalies.

Discussion: Dr. DENCH said that the distinguished guest of the evening had gone over the subject so thoroughly and with the care which distinguishes all his work, that very little remained to be said in the way of discussion. Until he had learned that Dr. Randall was going to read a paper on this subject, he had paid little attention to the subject of the lateralization of these conditions, but thinking that it would be of interest he had gone over his operating records to see

what results they showed, although no special pains had been taken in making the records with this point in view.

He had found records of 153 cases in which myringotomy had been performed—in 76 instances on the right side and in 77 on the left; so that it would seem from these figures that the acute cases do not vary very much.

In going over his books for the last few years, he had found 378 cases of acute mastoiditis—seven of them double—with 192 on the right side and 179 on the left side, showing that the right side is slightly more prone to involvement than the left. In cases of chronic suppuration there was very little difference: out of 261 cases operated upon radically, 129 were on the right side and 132 on the left. Coming to the cases of intracranial complications, 14 cases of epidural abscess were on the right side and 19 on the left—very little difference. In sinus thrombosis, the results were rather curious. Out of 27 cases, 22 were on the right side and 5 on the left. According to the anatomists the right sinus is the larger. This may account for the more frequent occurrence of the condition on the right side.

Of brain abscesses there were 10 cases—3 on the right and 7 on the left—including both cerebral and cerebellar cases.

Dr. DENCH said that he had never gone into this matter before but had been much interested in looking it up, and it seemed very strange that out of 27 cases of sinus thrombosis 22 should be on the right side and only 5 on the left. The practical value of this should be considered. Given a case of double mastoiditis, with symptoms of sinus thrombosis, it would be well to expose both sinuses, and if both were normal to the eye it might then be wise—if the symptoms pointed definitely to a sinus thrombosis—to open the right sinus. Both sinuses looking exactly the same, the preponderance of evidence would be in favor of a clot upon the right side rather than upon the left.

He disagreed with Dr. Randall upon one point which had been brought out in the paper. He does not personally believe that it makes any difference on which side of the septum the deformity exists, so far as affecting one ear or the other is concerned. Both nostrils open into the naso-pharynx, and we are not going to have more or less pressure on the ear

corresponding to the side of the deflection, for if the opening on one side is narrow it is broad on the other, and the fact of having a deformity on one side cannot count for much in making that ear a poor ear. He could not at the moment give his statistics in otitis media, but was inclined to think that this argument would scarcely hold good.

Dr. WHITING said that every one probably had more or less of the idea that one is prone to see cases where suppurative or non-suppurative cases occur rather more on one side than the other, but that the individual experience of any one man would not count for much in studying a matter of this kind. Dr. Randall had formulated a great many cases, and was able to give data very much more to the point than any of those present could give from personal experience in private practice, but however great his personal experience or private practice might be, they would not weigh much in determining the lateralization of conditions of this kind, in very great numbers. It was, however, a very clever idea to draw attention to this study, and as more men become interested in it and it is studied more thoroughly doubtless something would be brought out which would be of distinct value. It seemed to him that a point to be decided from a study of these charts and of any great number of cases would be of more practical value in relation to suppurative than to non-suppurative processes. In his own experience, in the scanty number of cases of which he could keep individual track, the lateralization of brain abscesses and sinus thromboses corresponded almost exactly with those presented by Dr. Dench. Out of nine cases of abscess of the brain, seven were on the left side—that is, nearly 80 % of left-sided brain abscess cases. In sinus thrombosis, of which he had had charge of 36 cases, 85 % were on the right side. This, of course, does not represent a very great number, and would amount in the aggregate to very little, nevertheless it was a matter of significance. The probability is, as Dr. Dench has said, that in the vast majority of cases the sigmoid sinus on the right side is larger than on the left, and dips more deeply, and there is therefore a thinner layer of protective bone between the antrum and the wall of the sinus. Accordingly it seems reasonable that given an equal amount of inflammation in both ears the one in which the bone is thin-

ner over the sinus would be the more likely to be attacked. Experience shows that the sigmoid groove on the right side is deeper and it seems that the clinical findings of the greater number of sinus cases on the right side than on the left would bear this out.

It seems also that the matter of the lateralization of the inflammatory diseases may bear some relation to the shape of the skull and conformation of the temporal bone, as indicated by the greater depth of the sigmoid groove,—whether the brachycephalic or the dolichocephalic type has anything to do with the frequency of infection to one side or the other. Something may be developed later on in the study of this subject.

Another element in the consideration of the lateralization of inflammatory conditions—a subject of which at present very little is known—is the lines along which bacterial propagation takes place,—whether one germ has different methods of propagation on entrance to the veins, lymphatics, and the like. We know very little of this at present, but from what the bacteriologists are discovering it seems probable that some very material knowledge along these lines may be anticipated within a reasonable length of time.

A question not raised by Dr. Randall suggests itself. Supposing it is true that, as Dr. Randall says, catarrhal diseases are found more frequently in men than in women—is this fact of any practical clinical value? At present it does not seem of much clinical or diagnostic importance. As to the secondary involvement of the labyrinth, if we know that the right ear is more apt to be attacked, we might say that the labyrinth on that side is more likely to be attacked, though that would not warrant us in urging treatment of the ear for fear of secondary trouble. The question, however, in regard to chronic and acute suppurations is interesting and valuable, and while the figures presented to-night are not tremendously comprehensive they are considerable, and as the experience of Dr. Dench and himself are so nearly corroborative in regard to sinus thrombosis and abscess of the brain, the value of the scheme is well worth considering.

Dr. GRUENING said that when he read the title of Dr. Randall's paper as to whether ear disease is more frequent

on one side than on the other, he had to confess to himself that he had no opinion on the subject.

The speaker, Dr. Randall, has brought out the fact that in men some ear diseases appear more frequently on the left side than on the right. This may probably be accounted for by the fact that boys fight and box, and that the left ear is more exposed to injury from a right-hand blow. It has been mentioned in the course of the discussion that abscess of the brain, and especially of the temporo-sphenoidal lobe, is more frequent on the left side. This greater frequency is only apparent, and is due to the greater facility of diagnosing left-sided abscesses by the presence of optic aphasia.

Dr. BERENS thanked Dr. Randall for calling attention to the fact that certain ear diseases do tend to lateralize to one side or the other, and Dr. Gruening for suggesting a cause for this lateralization. His own experience in regard to intracerebral complications agreed with that of Dr. Whiting and Dr. Dench. In eight cases of cerebral abscess that he has seen they all occurred on the left side. He had not looked up his statements of sinus thrombosis, but it seems they do tend to lateralize on the right side.

Dr. BRYANT regretted that he had with him no statistics to add to those presented by Dr. Randall. Dr Bryant said that he had been interested for some years in the possible effect on the ear of different methods of blowing the nose. The use of the right or left hand which would naturally incline the head to the right or left, stretching open the left or right Eustachian orifice, must accordingly inflate the ears differently. Forcible or gentle blowing also has a very different inflating power on the ear. Blowing with the anterior nares open or compressed with the fingers, determines whether the anterior or posterior nares will be cleared most. The compression of the nares does not allow sufficient current of air to dislodge masses of mucus about the Eustachian orifices. The frequency with which an ear is inflated must have influence for good or for ill; for good in sclerotic middle-ear catarrh, for ill, if infected mucus is blown into the tube or middle ear. It is fair to suppose also that inflation will have a prophylactic effect against "chronic middle-ear catarrh." Dr. Bryant

regretted that he had not yet been able to work out these ideas to their conclusion.

The question of nasal obstruction must be of considerable importance in determining the greater susceptibility of one ear over the other. Unilateral nasal obstruction therefore exerts a one-sided effect on the ears since it causes more congestion of the mouth of the Eustachian tube on the side of the occluded fossa than on the open side. Unilateral nasal obstruction very often depends upon deflection of the septum, which in turn originates generally from irregular eruption of the teeth. This latter deformity depends in turn upon causes commencing in earliest infancy. The most fundamental of these early causes is infantile nasal obstruction which interferes with the development of the superior maxillary bones. Dr. Dench had alluded to the question of intranasal pressure. Dr. Bryant thought that the unilateral intranasal causes of one-sided ear disease, when due to congestion of one side of the naso-pharynx, resulted from unilateral nasal occlusion rather than from intranasal pressure without occlusion. Dr. Bryant thought that blowing the nose one way or the other might determine which nasal fossa was kept the freer, and which Eustachian tube would be the least congested, and consequently which ear would be kept in the best condition.

Dr. RANDALL said that he appreciated the kindly discussion which his paper had received, and hoped that a further study of the subject would throw more light upon it than we now possess. Although he had worked a great deal with statistics he did not place the same stress upon them that some do, but had frankly presented the results of his studies, even when his figures seemed to show the reverse of the points which he wished to make. Some of these he believed of distinct value. Dr. Gruening's points in regard to rupture of the drumhead were extremely well taken. Of course, if the blow were struck from behind, it would come on the right ear, and if the striker were left-handed, that would also reverse things. This point had been brought out in a court-case many years ago, where a boy had been devilling a drunken man who struck him on the ear and his chronic suppuration lighted up to sinus thrombosis, cerebellar and pulmonary abscesses, and death. The

case was brought to court; and he pointed out the fact that it was the right ear which had been struck, face to face, indicating the lack of murderous intention, although the man was technically a murderer. The authorities abandoned the case as the man had been long in jail, which was a sufficient punishment for what he had done. This shows that some of these questions have a rather vital importance in cases which come before us, affecting sometimes even the happiness or the life of individuals.

As to the matter of the configuration of the skull, he felt considerable skepticism. In an examination of 700 to 800 skulls (A. OF O., xxiii., 3), he had failed to find any sure support of these contentions. He agreed that the right side has more often a larger lateral sinus (277:125) or jugular bulb (225:128), and that therefore theoretically the right sinus does penetrate deeper into the mastoid and comes closer to the antrum and other cells likely to be affected. Yet this averaged less than half a millimetre in 500 skulls scrupulously measured, with equal maxima and minima.

He feels strongly that there is more commonly jugular bulb involvement in acute suppurative than chronic cases. In not a few cases there is spontaneous cure, for the organization of the clot and the shutting out of the infection from the large vessels and the general system is the rule: while in the chronic cases we have the lateral sinus involved, and there is more danger of septicæmia, compelling operation. In the cases of sinus thrombosis, which greatly preponderate to the right side, we must temper the judgment with a study of how many are acute and how many chronic. That has a very distinct bearing upon what course we ought to take.

As to the relation of the nose and its influence upon the question of catarrhal involvement of the ear, he disagreed with Dr. Dench, and he felt that Dr. Berens had misunderstood his meaning, that it is the side opposite to the deviated septum which is more commonly affected. It was his contention that it is the narrow side which is inclined to chronically affect the corresponding ear. There is a point bearing out in appearance the view of Dr. Berens in regard to the practical manner of using the Politzer inflation; when it is desired to inflate the Eustachian tube on one side only, one will almost

invariably succeed best from the other nostril—will inflate the left ear, for instance, best from the right nostril. It seems, however, to be the ear on the narrow side of the nose which is more chronically affected, while the other is more open to acute involvement.

REPORT OF THE TRANSACTIONS OF THE NEW YORK OTOLOGICAL SOCIETY.

THOMAS J. HARRIS, M.D., SECRETARY.

MEETING OF NOVEMBER 26, 1907.

Dr. LEWIS showed an **osteoma of the external auditory canal**, removed very easily by operation through the meatus. It had been attached by a very small pedicle to the posterior inferior wall of the canal, near the beginning of its bony portion, and occupied almost the entire lumen of the canal. One blow of the chisel was sufficient to break it loose from its attachment. The hearing after the operation was normal, whereas before the operation it had been about 50 % of normal.

Discussion: Dr. PHILLIPS referred to a case where he did the post-auricular operation. Here there was a history of previous suppuration. The hearing was not improved.

Dr. DENCH emphasized the ease of removal in most cases.

Dr. BRYANT thought that there were two varieties, the sessile form situated near the drum-head, and the pedunculated form growing from the wall near the cartilaginous canal; these two varieties differed in their location, form, and etiology. The sessile variety was due to local irritation, usually caused by moisture in the canal, and is found chiefly in individuals who are in the habit of frequently immersing their head in water.

Dr. BRYANT exhibited a **specimen of the temporal bone and the corresponding cerebral hemisphere**. There had been physical signs of basal consolidation of the lungs, and high temperature; no ear symptoms save suppuration of the right ear. The operation showed a minim of pus. Death 3 days

after operation without meningeal symptoms. **Autopsy** gave **leptomeningitis** of right hemisphere, also **two thrombi of different ages**; one, the older, a mural thrombus of the right lateral sinus, extending into the posterior cerebral veins; the other, more recent, of the jugular foramen. The meningitis evidently originated by the spread of infection up the posterior cerebral veins and thus invaded the subdural spaces. The infection was streptococcic.

The differential diagnosis of mastoiditis and pneumonia was made by the divergence of the temperature and respiratory curves and the curve of the physical signs in the thorax.

Discussion.—Dr. RAE reported two cases of this infection. The physical evidences of mastoid involvement practically disappeared under observation, a small degree of temperature persisting. Operation revealed extensive destruction of bone in both cases.

Dr. DENCH said in his case the only symptom was mastoid pain; there was little temperature and little tenderness and no drum involvement.

Dr. LUTZ reported the case of operation on a child of six weeks who had two supernumerary tragi on one side and three on the other, one of which was really a bony projection from the zygoma.

Dr. HASKIN reported a case of **double mastoiditis** in a child of three, complicated by **broncho-pneumonia** of both lungs. He had seen the child a week previously and recognized the presence of adenoids and enlarged tonsils. When seen she was unconscious and semi-delirious; neither ear-drum showed any marked bulging and there was no sagging of the auditory canal. No bacteriological examination. Both mastoids were operated upon and showed extensive disease. The child was now improving.

Discussion.—Dr. LUTZ said that middle-ear disease frequently followed pneumonia; no doubt a number of the members had had cases of effusion of fluid in the middle ear, easily seen through the drum, as he had, following pneumonia.

Dr. GRUENING said that the drums often do not bulge; the pus drains into the pharynx. It is a question if the pneumonia is precedent. We often see the drum, in children, of a gray color covered by exfoliated epithelium.

Dr. DENCH reported a case of mastoiditis containing the streptococcus capsulatus. The operation showed an unusually thick cortex and two perforations, suggesting a Bezold abscess as well as an epidural abscess. The case is of interest in that it had been ten days under observation, with only slight mastoid tenderness and no fever. The blood examination gave a differential count of 58 %. This, to his mind, proved the worthlessness of such examinations in a pure mastoid affection.

Dr. HASKIN referred to an extensive mastoiditis in a negro who worked in a caisson. Here the cortex was very thick. The man suffered from profuse otorrhœa and had a large polyp of the canal, which he had removed previous to the mastoid operation.

Dr. KENEFICK said that in cases of thick cortex a thrombosis of the emissary vein was not uncommon, and that the œdema and tenderness could be distinctly made on thumb pressure.

Dr. GRUENING spoke of the possibility of a brain abscess discharging through the ear.

Dr. KENEFICK referred to a case of abscess of the temporo-sphenoidal lobe in his practice where this had occurred and the condition only discovered post-mortem.

Dr. DENCH said that in his opinion the removal of polyps through the canal was about the most dangerous operation we can do. The presence of granulation tissue always suggested diseased bone which usually demanded attention through a post-auricular incision. In this way we can always expose the tympanic roof.

Dr. Dench referred to a case of **brain abscess cured by operation through the tympanic roof**. At the time of operation, no provision was made for enlarging the meatus, and the meatus was consequently completely occluded. The case returned later, complaining of mastoid tenderness, and a second operation showed **cholesteatoma** within the tympanic cavity. The meatus was enlarged so as to afford free drainage of the tympanic cavity, the posterior wound sutured, and **the patient made a complete recovery**.

Dr. Dench emphasized the necessity of always enlarging the meatus in every case of radical operation, especially in

those in which intracranial complications were present, so as to thoroughly drain the middle ear through the external auditory canal, and thus prevent any reinfection of the intracranial structures.

Dr. GRUENING thought Dr. Dench's position about polyps was too radical.

Dr. QUINLAN reported the two following cases:

CASE 1.—A girl of 11 was brought to him last February with a history of chronic suppuration of 4 years' standing; through the perforation were seen small tufts of granulation tissue which did not disappear under alcohol applications. It was deemed best to put the child under an anæsthetic and gently curette these masses away. Strict antisepsis was employed during the operation, but in 72 hours a post-auricular swelling was seen that necessitated an incision and drainage for the relief of the accumulation of pus. It required 3 weeks to establish healing of the wound, but there remained some slight discharge, which has lasted up to the present.

CASE 2.—Girl of 8 years, with an old history of purulent otitis residual, which became acute under a new infection and developed mastoid swelling and redness. The classical operation was performed, which healed kindly in 6 weeks, but small buds of granulation tissue extruded from the opening of the drum. The writer advised anæsthesia and gently curetted the mass from the bony base. Four days following, a swelling appeared over the mastoid, necessitating incision and drainage, which drew from the family much criticism.

THE CHICAGO LARYNGOLOGICAL AND OTOL- GICAL SOCIETY.

MEETING OF NOVEMBER 12, 1907. J. HOLINGER, M.D.,
CHAIRMAN.

A Case of Abscess of the Neck for Diagnosis.

Dr. G. F. FISKE exhibited a patient, 31 years of age, with a history of abscess of the neck which opened spontaneously into the auditory canal. The symptoms began with hoarseness, pain, and swelling in the throat and side of the neck. The swelling was incised but no pus was found. After the discharge began from the ear, the abscess opened through the primary incision in the neck and has continued to discharge for five weeks. Dr. Pierce thinks a microscopic examination might clear up the diagnosis. It may be either tubercular, syphilitic, or actinomycosis, with the probabilities in favor of the last.

Dr. HOLINGER thinks it is probably tubercular and suggests that members exhibiting cases before the Society should be prepared with full microscopic findings.

A Case of Foreign Body in the Larynx for 2½ Years.

Dr. STANTON FRIEDBERG reported a case of a girl, 12 years old, who had complained of hoarseness for 2½ years. Recently she had experienced some pain, but gave no history of dyspnoea or of ever getting a foreign body into the larynx. When first examined, a mass could be seen covering the left vocal cord and part of the right, extending anteriorly to the epiglottis. It appears smooth and seemed to be covered with mucous membrane. About the centre of the mass a narrow transverse dark line was seen which led to the suspicion of a for-

eign body. This was confirmed by X-ray examination. The first attempt to remove the foreign body was under cocaine anæsthesia, but was unsuccessful largely because of lack of co-operation on the part of the patient. The second attempt was under chloroform anæsthesia, but the foreign body could not be secured with the instruments at hand. Later the mass was incised and the foreign body easily removed with laryngeal forceps. It proved to be a wire eye such as is used upon women's dresses.

A Case of Healed Primary Nasal Tuberculosis.

Dr. JOSEPH BECK exhibited a case of a woman, aged 54 years, who had suffered from tubercular ulceration of the nose for twenty years. The left nostril had healed before the patient came under the care of Dr. Beck, but with much contraction of the anterior naris. The tubercular process on the right side began about seven years ago and involved the floor of the naris and the front end of the inferior turbinal. The whole area involved was excised eight months ago. The microscope showed well defined giant-celled tubercle, and tubercular infiltration, although smears had shown no tubercle bacilli. The wound healed promptly and for four months has been entirely well. Mercury and potassium iodide had been used in full doses with no improvement.

Dr. BALLENGER states that he treated this patient 13 years ago, and that she has a brother with a similar lesion; that scrapings from the left side at that time were injected in guinea pigs which developed typical tuberculosis. Since no trouble could be discovered in the chest or in any other part of the body, it was thought at the time to be a case of primary nasal tuberculosis. It showed a tendency to heal over during the summer and ulcerate when winter came. From the appearance of the healed area in the right nostril he thinks probably it will break down again when winter comes.

Answering an inquiry by Dr. ROBERTSON, Dr. BECK states that the patient had inunctions of one dram of mercury ointment for 11 weeks, and that she took as much as 340 drops of a saturated solution of potassium iodide daily.

Dr. REISCHMAN suggests the use of the X-ray in such cases since the tubercular bacillus is very susceptible to its influence.

Dr. HOLINGER referred to a case he had shown the Society four years ago, and states that the healed areas are frequently covered with crusts and small nodules even when not actively ulcerating.

Dr. BECK, in closing, remarks that formerly, when this area had healed over, crusts and elevations were always present, but that since the ulcer was excised the surface has remained smooth and clear. This case was reported to the Society two years ago as having been cured with radium, but it began ulcerating again soon afterward. The X-ray had been used eight weeks and light therapy and cauterization tried without benefit. He thinks the tubercular process is now entirely eradicated and that the patient will experience no further trouble.

Radiography in the Nose, Throat, and Ear.

Dr. BECK exhibited a number of X-ray negatives of the head, demonstrating conditions of the frontal, ethmoid, and maxillary sinus, and described the technique necessary to secure satisfactory results. The patient's head must be firmly held face downward against the plate on an inclined table. The axial rays must pass through the head above the occipital protuberance. The principal cause for failure in the past has been that the rays of light passed through the head at too low an angle and the occipital protuberance and base of skull obscured the nasal accessory cavities. In order to secure correct information, the negative itself must be studied by the rhinologist as the finer gradations of light and shade which can hardly be brought out in a print must be carefully observed. Lateral views are of no practical value except to indicate the condition of the mastoid and occasionally to show abnormalities of the frontal sinus. He exhibited one negative showing disease of the mastoid process and stated that he had a paper on that subject in course of preparation, which later he would present to the Society.

Dr. BALLINGER reports that out of fifty negatives of the head he has two showing absence of the frontal sinus and three cases in which the ethmoid cells extend out about half way across the orbit. In such cases these ethmoid cells are practically beyond the reach of instruments. Radiographs are of

value in showing the extent of diseased condition and enabling the surgeon to have some idea how extensive an operation will be required.

Dr. GOOD has used the method advocated by Dr. Beck with satisfactory results.

Dr. PIERCE compared one of Dr. Beck's negatives with one of his own from the same patient, but taken at a lower angle, and demonstrated the greater value of Dr. Beck's method.

Dr. REICHMAN approves of Dr. Beck's method but thinks we will soon be using stereoscopic views entirely since they will give us an idea of the depth of the shadows. He does not think it possible to demonstrate disease of the posterior ethmoids or of the sphenoid sinus.

Dr. CARPENTER thinks the angle at which Dr. Beck placed the plate gives a distorted image and that the time of exposure is unnecessarily long.

Dr. OSTROM advocates the triangulation method of McKenzie, the fixed point in front of the face aiding materially in determining the relation of diseased areas.

Dr. MARQUIS congratulates Dr. Beck upon the thoroughness of his work, but thinks the diagnosis can be made by simpler methods. He has seen Dr. Killian do seven operations during the past year on the nasal accessory cavities and in no case did he use the X-ray for diagnosis, but only employed it to determine the relation and extent of the cavities involved.

Dr. SHAMBAUGH thinks that the X-ray must not be depended upon for diagnosis, that it is only valuable when it confirms intranasal findings.

Dr. FRIEDMAN approves the plan of making the exposure with a probe in the diseased sinus.

Dr. BECK does not depend upon the plates for his diagnosis, but only uses them as an aid in the intranasal examination. He thinks the X-ray as he uses it is entirely harmless. He has been doing some work along the line of stereoscopic X-ray views.

Case of Labyrinthine Deafness with Preserved Island of Hearing.

Dr. SHAMBAUGH presented a case of labyrinthine deafness in a young man twenty-four years of age. The deafness was

first detected before he was nineteen years of age. The onset was insidious. Tinnitus aurium did not appear until a couple of years ago. It has the character of a high-pitched cricket-like sound. A brother several years older has the same type of deafness coming on in practically the same way. No history of deafness in other members of the family obtainable. No history of lues either acquired or congenital. Membrana tympani in both ears was normal. Functional examination gave the following:

Whisper, right ear, 82 heard at two inches.

“ “ 66 not heard.

left ear, 18 heard at two inches

“ “ 66 not heard.

In the Weber test the A fork was indistinctly lateralized in the left ear.

In the Schwabach test the duration of bone conduction for the A fork was quite normal.

The Rinne was positive in both ears.

The examination with the Bezold-Edelmann continuous series of forks gave the following: In the right ear all the tones were distinctly heard up to f^3 . Above f^3 there was no hearing at all. In the left ear all the tones were heard from the lower limit up to f^4 . From f^4 to a^4 total defect. From a^4 to e^5 there was a well preserved island of hearing. From e^5 to the upper limit no hearing at all.

The hearing tests are typical of labyrinthine deafness. The age at which the process developed, its insidious onset, the occurrence of the same trouble in another member of the family, when taken in connection with the fact that there is an absence of any of the usual causes of primary involvement of the labyrinth, lead one to suspect the possibility here of otosclerosis in which the spongifying process has involved the cochlea without causing a fixation of the stapes. It has been pointed out by Siebenmann that otosclerosis does occur in just this way. It is possible that this may be a much more common course for otosclerosis than we suspect.

The most interesting point in connection with these cases presenting circumscribed defects in the tone scale and the preservation of islands in the midst of the scale is the light

which this phenomenon throws on the question of tone perception. This condition is one of the strongest proofs of the theory that the perception for the several tones takes place in separate and distinct parts of the cochlea.

Dr. PIERCE believes that the absence of the Bezold triad, which is invariably present when the process of otosclerosis has involved the foot-plate of the stapes, does not exclude the diagnosis of otosclerosis in this case. He pointed out that otosclerosis occurs in two distinct types, depending on whether the process involves the stapes or not. In the first case we get the picture of middle-ear deafness and in the latter that of nerve deafness.

Dr. HOLINGER called attention to two cases reported by Siebenmann occurring in the same family. In one case there was fixation of the stapes and in the other not. In one case the symptoms were those of middle-ear deafness, and in the other of nerve deafness. He called attention to the fact that while we recognize that the process is an hereditary one, it often happens that one or more generations are missed entirely.

MEETING OF DECEMBER 10, 1907. J. HOLINGER, M.D., CHAIRMAN.

Intranasal Drainage of the Frontal Sinus.

Dr. INGALS exhibited his instruments for intranasal drainage in frontal-sinus disease. They consist of a pilot burr passing over a steel probe introduced into the sinus. Also a protector to prevent injury to the inner table and a gold drainage tube for keeping the sinus open after operation. He finds that the probe can be introduced into the sinus in 95 per cent. of the cases. He believes the burr is the best method of opening the sinus in from 97 to 98 per cent. of the cases. The burr is driven by an electric motor and the time estimated for entering the sinus is two seconds. The gold drainage tube is split at the upper end and spread so that it is self-retaining. When introduced, a paraffin-covered gelatine capsule is slipped over the end to hold the flaring parts together. The moisture dissolves the capsule and the split end separates, retaining the tube in position. It is expected that the patient will wear the drainage tube for several

months. For the first few days the sinus is packed with gauze saturated with a 20 per cent. zinc chloride solution, after which the patient is able to keep the cavity cleansed with a bulb syringe. The advantages claimed for this method of operating are: 1. No external scar. 2. The slight reaction, the patient rarely losing more than one or two days' time. 3. It can be done under local anæsthesia, or in very nervous patients under ethyl chloride. 4. The drainage under ordinary condition is ample. 5. Should there be recurrences they are of short duration because of the free drainage. 6. The burr as now constructed will not injure the dura. 7. If for any cause the operation is not successful the external operation can be done later. 8. Healing is as rapid as after any other method of operating. 9. It is the easiest and quickest method of providing free intranasal drainage of the frontal sinus.

Dr. CASSELBERY thinks the instruments are very ingenious and fill a long-felt need. He has not used them often, but in one case operated upon three years ago and examined lately he finds the results very satisfactory. He does not use the motor for driving the burr but an ordinary handle. It takes longer to enter the sinus by this method, but he thinks the danger is less. The term "cured" should not be applied to these cases since there is always some slight mucous or muco-purulent discharge. They are, however, symptomatically cured, which is as much as the patient should expect.

Dr. BALLENGER did not think much of the instruments at first, but is impressed with their value after seeing a demonstration of their use. He thinks carbolic acid better than zinc chloride as an application to the frontal sinus. It combats infection by attracting leucocytes. The dura is a better protection to the brain than the inner table and no harm will result if the dura is not ruptured.

Dr. BECK has not used the method but thinks the external operation is better. He finds the X-ray of value in determining the extent of the frontal sinus, but the rays must pass through the head at the proper angle to give satisfactory results. He has used the HALLE operation, but it was followed by alarming reaction.

Dr. FREER thinks that in the form of sinus disease known

as sinusitis frontalis exedens (KILLIAN) this operation is contra-indicated.

Dr. SHAMBAUGH believes that in most cases the intranasal operation is the one to be performed for the relief of frontal sinusitis. In most of the acute cases relief is obtained by the local use of adrenalin and cocain. In a large part of chronic cases the establishing of intranasal drainage by means of the removal of the anterior end of the middle turbinated body and curettement of the anterior ethmoid cells give the patient relief of all symptoms and often result eventually in complete cure. The external operation should be reserved for only such cases which are not relieved by intranasal work. He recalled a chronic case where he had operated some years ago with relief of symptoms. Later, while in this condition, the patient was operated on in Germany by the external method, and at present the condition appears to be just what it was before the external operation plus his deformity.

Dr. GOOD thinks the secret of success lies in removal of the anterior end of the middle turbinate and making a free opening into the frontal sinus no matter what method is employed. He is not favorably impressed with the drainage tube and suggests silver nitrate solution as an application.

A Demonstration of New Instruments Devised by Killian for Use in Bronchoscopy and Æsophagoscopy.

Dr. MARQUIS exhibited the KILLIAN extension tubes and forceps and demonstrated their advantages over other instruments on the market. The light at the proximal end of the tube, he thinks, is better than the light of the distal end or on the forehead of the operator.

A Case of Sarcoma of the Root of the Tongue with Demonstration of Microscopic Section.

Dr. CORWIN reports a case of sarcoma of the root of the tongue associated with nephritis, anasarca, pallor, cachexia, and anæmia. The growth which was removed was the size of a walnut. It had a broad pedicle and crowded upon the epiglottis. The microscope showed the tumor to be a round-celled sarcoma. Trypsin injections were given in 10-minim

doses. A few weeks later a tumor was discovered in the left lobe of the liver. The trypsin was continued, from twenty to thirty minims by the mouth. Then the abdominal tumor gradually disappeared, the cervical glands which had been enormously swollen subsided, and the patient's health is reported as fully restored. While this case is not reported as a cure of sarcoma by the use of trypsin, Dr. Corwin thinks it rather an unusual coincidence.

Dr. SHAMBAUGH thinks sarcoma of the tongue is very rare. He has seen one case of spindle-celled sarcoma. Since sarcoma sometimes disappears without any known cause, he is not inclined to look upon trypsin as necessarily curative in these cases, but it is worthy of a trial.

Dr. ROBERTSON thinks trypsin is of no permanent value and that all cases of genuine sarcoma eventually die of the disease. If the primary lesion heals, it is sure to reappear in some other part of the body—it may be as long as thirty years afterward.

ARCHIVES OF OTOLOGY.

REPORT OF TWO CASES OF SINUS THROMBOSIS COMPLICATED BY CEREBRAL ABSCESS IN THE TEMPORO-SPHENOIDAL LOBES.

BY DR. WILLIAM R. DABNEY, MARIETTA, OHIO.

(With two charts on Text-Plate III.)

THE following cases are reported to illustrate not only the seriousness of delay of an operation when once the mastoid has become involved in a pyogenic process, but also to demonstrate what life-destroying complications may be going on in the brain and yet the patient be able to go about and attend to the duties associated with his avocation in life in a fairly intelligent manner.

When once the diagnosis of mastoid empyema is positive, there should be no delay in opening the mastoid cells and freeing them of the products of inflammation, as when the encephalon begins to disintegrate or an infected thrombus of a dural sinus develops, the hope of recovery is very meagre; and last but not least, if the pia mater or arachnoid should become the seat of a purulent inflammation, the prognosis is extremely grave, as the death-rate is practically 100%.

To those that are thoroughly familiar with mastoid surgery, mastoid empyema is regarded in the same light as is appendicitis by the abdominal surgeon when it has reached the stage of purulent effusion, and yet I have met men of undoubted ability in abdominal surgery who believe that appendicitis should be operated as soon

as the diagnosis is established and before pus has developed, in order to prevent a possible general peritonitis, but yet these same men in a case of mastoid empyema will advise delay or palliative measures without considering the fact that when once the leptomeninges, membranes that are infinitely more delicate than the peritoneum, become involved in a pyogenic inflammation as a complication of a purulent mastoiditis one can be prepared to fill out the death certificate at his leisure as in the vast majority of cases it is a question of a very short time until the patient makes an *exitus letalis*.

CASE I.—Male, age 48 years. This case came to my notice on Jany. 20, 1907.

HISTORY.—*Heredity*: Negative. *Personal*: Says that he had a severe cold about the middle of December and that he began to have pain in the left ear about four days after the onset of the cold. A discharge appeared from the ear on the second day after the pain began. The ear has discharged moderately since and there has been a continuous pain in the ear and mastoid, associated with more or less pain of the entire head. It was remarked by one of the gentleman's friends that he had seemed to be in a somewhat dazed condition for the past week, as he did not take his usual interest in affairs about the farm and his replies to questions were surly and grudgingly given, contrary to his usual straightforwardness.

Present Condition.—Patient is slow to comprehend what is said to him, as our questions have to be repeated several times before we are able to get a reply. Temp. 101° F. by mouth. Pulse 88. There is a thick blood-streaked discharge coming from the left ear. Smear taken and streptococci found. A perforation that is not large enough to admit of free drainage is seen in the anterior-inferior quadrant of the drum. There is slight sagging of the posterior-superior membranous canal. Tenderness on pressure over the tip and antrum is well marked and there is a fair amount of swelling of the soft tissues overlying the mastoid.

Percussion of this side of the head does not increase the general head pain nor cause pain to radiate from the point of

percussion over the head. Reflexes are normal; pupils are slightly dilated but react to light and accommodation.

OPHTHALMOSCOPIC EXAMINATION.—*Right Eye:* Negative. *Left Eye:* This eye is more sensitive to light than its fellow and the disk margins are rather indistinct.

Diagnosis.—Mastoiditis with possible intracranial complications. It was advised that the patient be kept under observation until the following morning before operating, but he insisted that the operation be done at once, and his friend agreed with him.

OPERATION.—*Anæsthetic:* Chloroform. Only a slight amount of yellow pus was encountered and that was in the antrum, but the tip cells were filled with a thin dark fluid. The trabeculæ were very much softened and masses of dark granulations were found in all the cells. The sulcus of the sigmoid sinus lay so far forward that the posterior canal wall had to be taken down before the antrum could be reached. The tympanic cavity was found full of dark granulation material like that encountered in the mastoid, and there was a perforating erosion of the roof of the tympanum through which dark granulations were protruding. These granulations were curetted and a possible perforation in the dura looked for but none was found.

The patient did very well for forty-eight hours after operation, when the temperature reached 103° F. and the pulse 98. He was very restless and semi-delirious, but when questioned repeatedly he would reply briefly and slowly.

The dressing was taken down and the exposed dura showed signs of beginning ulceration, but there was no discernible perforation in the dura. The temperature dropped two degrees after the dressing, but the pulse became slightly accelerated.

On the following morning (the third day after the operation) the patient was perfectly conscious and the restlessness of the previous evening had disappeared. He expressed himself as feeling better than he had at any time since his sickness began. At this time there was a slight Babinski reflex and Kerning's sign was positive, the angle of extension being much less than 135° F.

Jany. 25th, the morning of the fifth day since the operation.

Temp. 100° F. Pulse 96. He could not be aroused sufficiently to answer questions, but would swallow water when it was placed in his mouth. There was a motor paralysis of the entire right side of his body, the different members of which became paralyzed simultaneously. Both pupils are moderately dilated and they react very sluggishly to light. There is a choked disk to the extent of five dioptries in the left eye.

A diagnosis of brain abscess was made, but as the patient's wife had returned to her home in the country it was several hours before her consent for a second operation could be obtained.

It was thought that there was a purulent meningitis present as there was some rigidity of the posterior cervical tissues and the head was retracted; there had been a number of well marked clonic contractions of different members of the body. He was wildly delirious at times and it was with the greatest difficulty that he could be restrained sufficiently to keep him in bed.

As the motor paralysis of the face, arm, and leg had appeared simultaneously without a coincident sensory paralysis it was thought that the cerebral abscess was located above and external to the internal capsule, being situated most probably in the region of the lenticular nucleus where the motor tracts cross.

Under chloroform anæsthesia the perforation in the roof of the tympanum was enlarged sufficiently to admit of a free incision of the dura. The incision in the dura was started at the point where an ulceration had been previously noted and was carried outward and backward along the floor of the middle fossa. A curved grooved director was introduced upward and inward into the brain for a distance of one and one-fourth inches, when about two drams of foul-smelling pus was evacuated. This pus contained streptococci.

Owing to the irregular and rapid interruptions in the temperature curve and the slight chilly sensations that were complained of at times by the patient, it was thought that we might have to deal with a complicating sinus thrombosis; accordingly the sinus was exposed and an aspirating needle of large size was pushed through the outer wall of the sigmoid sinus and a free flow of blood at once followed, but when

pressure was applied above the needle the flow of blood immediately ceased. As the patient was sinking rapidly under the anæsthetic it was not deemed prudent to investigate the sinus farther at this time.

Jany. 26th.—Morning after the secondary operation and sixth day after the primary operation. At my visit this morning I found that the patient had some use of his right arm and leg, and he seemed to be conscious, as he made an effort to reply to questions, although his replies could not be understood as he could not articulate distinctly.

During the late afternoon of this date the patient became unconscious and had convulsive seizures which were repeated at frequent intervals during the night.

Our patient died at 10 o'clock the following morning without regaining consciousness. An autopsy was not permitted.

CASE 2.—White male, age 15 years. I first saw this patient at 8 P. M. Sept. 7, 1904, in consultation with Dr. C. M. Boger of Parkersburg, W. Va.

History.—Heredity—nothing that would influence the present trouble. Personal—was struck on the right side of the head with a stone about one year ago with sufficient force to render him unconscious for a short time. Has had a number of attacks of purulent otitis in the right ear which is the seat of the present disturbance. Present illness began ten days ago, which was three days after the patient had been bathing in one of the mountain streams of Colorado.

Present Condition.—Temp. 103° F. Pulse 48. Resp. 26.

The patient had the appearance of one suffering from a general septicæmia; there were jaundice and constipation; the entire body bathed in a cold clammy sweat; the breath foul, and the tongue, which was deeply furrowed, was plastered over with a dark brown coat. His voice was tremulous and his speech hesitating. There was œdema over the mastoid and the ear was tilted well forward.

The pain that he complains of is referred to both the ear and the mastoid. The slightest pressure applied over the antrum and mastoid tip causes excruciating pain.

There is a copious flow of sanguinolent pus from the external auditory canal. The external ear and canal were cleansed and a fair-sized perforation could be seen in the lower

anterior quadrant of the drum. The inner end of the superior-posterior membranous canal is boggy and sagging. A smear was taken from the pus as it came through the perforation in the drum and was found to contain streptococci and what were thought to be the diplococci of Weichselbaum.

When the patient assumes a vertical position subjective vertigo is complained of. He says that the whole right side of his head aches quite severely, and when this side of the head is percussed the pain radiates over the entire head. There is a dull aching pain in the right eye accompanied by hyperæmia of the conjunctiva and photophobia. Ophthalmoscopic examination of this eye shows a well defined papillitis.

Diagnosis.—A positive diagnosis of mastoiditis was given, and on account of the low pulse and high temperature provisions were made in the diagnosis for the possible complications of brain abscess and purulent meningitis.

For twenty-four hours previous to the time that I saw this patient an aural ice-bag had been applied over the mastoid without the slightest amelioration of the symptoms, and as we did not deem it advisable or prudent to further prolong the abortive plan of treatment we urged an immediate operation, but we were met by a request to wait until the following morning as the relatives of the boy could not bring themselves to believe that he was in a very serious condition.

Sept. 8th, 3 A. M.—Temp. 97.4° F. Pulse 43.

He was very restless during the night and had a slight chill at midnight. His replies this morning were quick and intelligent, and he seemed so much better that he was allowed by his family to get up and dress and go to a hospital in an open buggy.

The family were still reluctant to have an operation, but after being apprised that they would have to assume the entire responsibility if this procedure was longer deferred, their consent for an operation was very hesitatingly given and it was intimated that if the case terminated fatally under our manipulations it might be a question of "Pistols for two, and coffee for one," as they were from Colorado.

Operation.—The outer cortex was only of moderate thickness and pus followed the removal of the first chip of bone. The entire cellular structure of the mastoid was found to be

filled with the products of inflammation. A mass was found in the antrum and the chloroform test showed it to be pure cholesteatoma. An erosion was seen in the roof of the antrum through which granulation tissue was pouting and a few drops of pus could be seen exuding from this granulating mass.

While curetting the fistulous opening in the lamina vitrea the curette entered a small perforation in the dura mater and a slight amount of pus escaped when the curette was withdrawn. It was the intention of the operator to explore the brain in this locality but not in so precipitate a manner. The perforation in the dura was enlarged sufficiently to allow us to inspect the brain and an area of necrotic brain tissue about the size of a large hazel-nut was found.

The margins of the dural incision were held apart with small retractors and a layer of granulations and thick bloody pus could be seen on the inner surface of the dura. The pus in the subdural space was mopped with tufts of cotton wrung out in physiologic salt solution, and the necrotic brain tissue was scooped out and a wick of gauze wrapped in guttapercha tissue was used as a drain. The mastoid wound was packed with strips of iodoform gauze.

Sept. 10th, 6 P. M.—During the past twenty-four hours the patient has had two chills and perspired quite freely. There have been several abrupt and rapid interruptions in the temperature curve and the pulse has had a wide range. The temperature has been as low as 100° F. and as high as 105° F. during this time, and the pulse has been from 50 to 106 per minute.

The neck has become very tender and cedematous along the course of the internal jugular vein, and the lymphatics of this region are enlarged and sensitive. The boy has developed a cough which is accompanied by a slight prune-juice expectoration and large moist râles are heard on auscultation.

A sigmoid sinus thrombosis was suspected and the patient was taken to the operating room and chloroform administered at 8 P. M. of this date. Owing to the symptoms of metastasis that were already manifested, a primary resection of the internal jugular vein was at once resorted to, the vein was resected from beneath the clavicle to its exit from the skull. The sinus was then uncovered backward from the knee for

three-fourths of an inch, and downward below the level of the digastric fossa, but a palpable clot could not be detected.

The parietal wall of the sinus was thickened and covered with a layer of plastic lymph. We were prepared to open the sinus, but at this juncture the anæsthetist announced that the patient was failing rapidly, and the operation was discontinued without opening the sinus, but a strip of gauze was hurriedly packed against the exposed wall of the sinus and under the margins of the bone wound with sufficient firmness to preclude the passage of blood through the sinus and to obstruct the mouths of the vessels that are tributary to the sinus in its vertical and horizontal portions, and also to prevent particles of a possible septic thrombus from entering the general circulation through the torcular end of the sinus.

Sept. 14th.—For the past two days the boy has been perfectly rational at times, and at other times he has had an almost maniacal delirium, swearing at the nurses and members of his family, and it required the combined efforts of several persons to restrain him in bed. There is a convergent strabismus of the right eye and the pupils of both eyes are moderately dilated and sluggish to light and accommodation; the skin is flushed and tache cerebrale can be demonstrated. There is some rigidity of the neck and the head is slightly retracted. He cannot move the left arm and it is only after stimulation by repeated requests that he is able to move the left leg. The skin is hypersensitive at points, while at other points there is cutaneous sensory anæsthesia to pressure, but he complains of an intense itching and pricking of the skin. When conversing he now and then drops a syllable from his words and the elided syllable may be from any part of the word if it be a word of more than one syllable. During his lucid periods he says that he is conscious of this defect in his speech but that it is impossible for him to avoid it. When writing from dictation he transposes the words of the sentence so that they are rendered meaningless or the sense is entirely changed. He is unable to designate common objects by their proper names, as he calls an apple a ball. As you will note, he retains the sense for form but not for names. Ankle clonus is noticeable on the right side, and Kerning's, Strumpell's, and Babinski's signs are positive.

Sept. 16th, 5 P. M.—There is complete motor paralysis of the left leg and arm; ankle clonus is highly manifested in the left limb and to a slight extent in the right one; he is very irritable and replies very slowly or not at all when questioned. He has been constipated for several days but has not vomited although he has had considerable nausea.

For the past twenty-four hours the temperature has not been above 102° F. nor below 100° F., while the pulse variations have been from 45 to 56 per minute.

On account of the paralysis and the continued low pulse-rate it was thought that another abscess was developing in the brain.

The patient was anæsthetized at 8 P. M. of the above date, and an attempt was made to open the skull over the arm and leg centres on the right side, but when the diploic structure was reached the hemorrhage was so profuse that it was not checked until wooden plugs were driven into the diploic sinuses, and as the patient was not taking the anæsthetic kindly all operative procedures had to be abandoned for the time.

Sept. 17th, 8 A. M.—The patient is resting easier this morning, and after being repeatedly asked to do so he is able to move the left leg slightly and he can exert some slight pressure with the left hand. When questioned his replies are more quickly given and his attention can be longer sustained than it could yesterday.

Sept. 18th, 8 A. M.—The patient's mental condition is not so good this morning, and there is a complete motor paralysis of the left arm and leg, the angle of the mouth droops slightly, and the left eye does not close perfectly.

It was again decided to make an attempt to reach the abscess in the brain as we could not believe that the extensive paralysis was due to the purulent meningitis that was present in the case. The patient was anæsthetized and the primary mastoid wound was enlarged upward and forward for three-fourths of an inch above the temporal ridge. The dura was incised and a slender bistoury was carried upward and inward into the brain until the abscess was reached when a quantity of sanguinolent pus escaped. I will not attempt to estimate the amount of pus that was set free as it might lead you to

think that I have macropsia. The sinus was opened at this sitting and a small elastic clot was found low down near the jugular bulb.

From the time of the opening of the second abscess in the brain the recovery of the patient was uneventful and he returned to his home in Colorado in ten weeks from the date of the primary operation.

The symptoms that were manifested in this case and the location of the lesion were somewhat at variance. The zone of language is said by authorities to be located in the cortex of the left temporo-sphenoidal lobe in a right-handed, and *vice versa* in a left-handed, person. This young man is right-handed and he is not ambidextrous; the brain abscess in this case, as you will remember, was located in the right temporo-sphenoidal lobe.

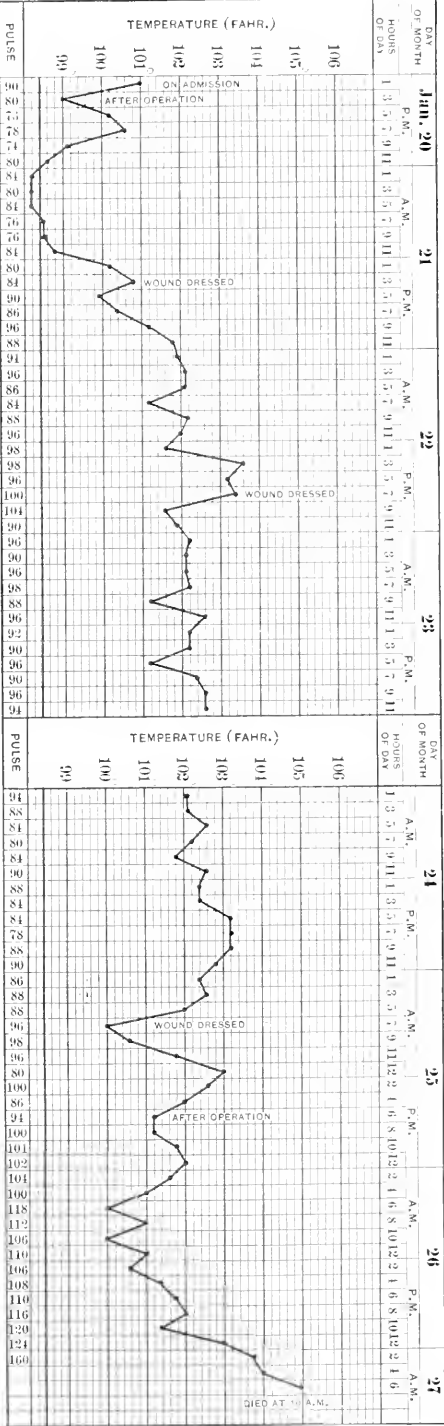
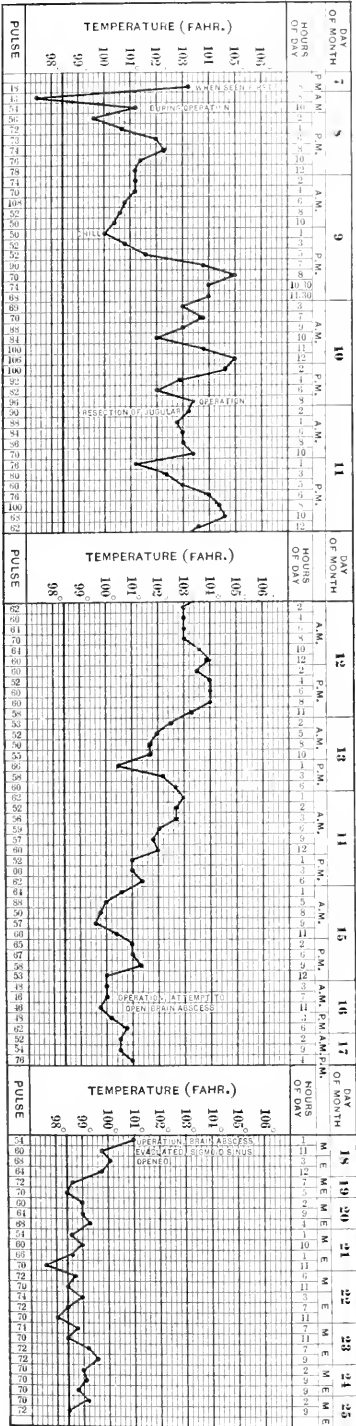
I do not think that there can be the slightest doubt as to the presence of a purulent meningitis as a complication in this case, as pus was found in the subdural space at the primary operation, and that a diffuse leptomeningitis was subsequently developed was amply demonstrated by the symptoms that supervened, as there were areas of thoracic and abdominal pain, as well as areas of cutaneous sensory anæsthesia at different levels of the cord.

The aphasic symptoms may have been due to an extension of the purulent meningitis to the opposite side of the head. If this were the case and the pressure was great enough to cause the aphasic manifestations, would it not have been possible for the confined exudate to have produced a motor paralysis of the right side of the body? Or could a cerebritis that was consequent to a purulent meningitis be responsible for the aphasia without the encephalitis being extensive enough to affect the motor area? If the aphasia was due to the meningitis, or cerebritis, and not to the brain abscesses, why did the pressure symptoms subside almost immediately after the second abscess in the brain was drained?

There was one symptom in this case that I did not al-

CASE 2.

CASE I.



lude to in the early part of this paper as all of my notes of the case were not at hand at the time it was written. The symptom which I refer to is one that is quite diagnostic of brain abscess when it occurs early and is manifested on the opposite side of the body to that of the brain abscess. The symptom which I point to is the rapid wasting and emaciation of the palsied side of the body in contradistinction to the slower wasting and emaciation that is seen in a hemiplegia that is due to a cerebral embolism.

I may be justly or unjustly criticised for not investigating the sinus at the time of the primary operation, but the boy had had only one chill and it could have been accounted for by the acute brain abscess that was developing, or the purulent meningitis might have been responsible for the rigor.

The bacteriological and pathological examination of the excised jugular vein demonstrated a septic thrombophlebitis, as streptococci were found in the walls of the vessel and infected parietal thrombi were discovered adherent to the intima almost as far down as the site of the lowermost ligature, and a pure culture of streptococci was grown from these thrombi.

From the information that was gained from the above examination I think that we were amply justified in doing a primary jugular resection, if the symptoms had not warranted such a procedure. As septic parietal thrombi were found so low down in the vein, one can readily see that simple ligation of the vessel high up in the neck would not have been radical enough to have brought about the termination of the septicæmia and pyæmia which occurred so soon after the vein was resected.

A CASE OF ACUTE INTERNAL HYDROCEPHALUS SECONDARY TO STREPTOCOCCAL INFEC- TION OF THE LABYRINTH.

By SYDNEY R. SCOTT, M.S. LONDON, F.R.C.S. England,

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THE following case is described:

1. On account of its comparative rarity.
2. Because it throws light on the early diagnosis of labyrinthine infections.
3. For the reason that an operation on the labyrinth would probably have saved the patient's life had the true state of affairs been realized in time.
4. Inasmuch as it was possible to demonstrate post-mortem the precise connection between the labyrinthine mischief and the attendant hydrocephalus.

Joseph O'Grady, age 14, a schoolboy, was admitted to St. Bartholomew's Hospital, 1st March, 1907, under the care of Mr. Cumberbatch, to undergo the radical mastoid operation for chronic otorrhœa. The patient had been attending the Aural Out-patient Department for nearly six months, without making any signs of progress towards recovery.

The tympanic cavity was full of granulations which obscured all normal landmarks. There was no mastoid swelling or tenderness.

Mentally he was very backward, so that the tests for hearing were unreliable.

He was evidently very deaf in the left ear, but whether there was perosseous loss could not be ascertained. He made no complaint of giddiness and there was no facial paralysis. Past lesions had led to the removal of one eyeball and dense corneal opacities in the other.

During the four days he was in the hospital before the operation his general health was good; he was up and out of doors daily; he slept and ate well.

Operation.—On the 5th March, 1907, during Mr. Cumberbatch's temporary absence, I performed the radical mastoid operation on the left side.

The lateral sinus was very large and occupied an unusually anterior position, reaching to the posterior wall of the external auditory canal; the blue color of the sinus-contents could be plainly seen through the bone, after reflection of the integuments and periosteum.

The antrum was small and deep, and lay in a plane posterior to the prominent genu of the sinus.

The floor of the middle cranial fossa bulged down, and overhung the antrum externally.

To obtain freer access to the antrum, the genu of the lateral sinus was freely exposed and displaced backwards. In doing this, the sinus was unintentionally opened.

After controlling the bleeding, the antrum and attic were opened and the radical operation completed in the usual way. The dura of the middle fossa where it overhung the antrum was exposed, otherwise there was nothing further requiring special mention. The inner tympanic wall was carefully inspected, but not explored with a probe. The external arcuate eminence, the Fallopian aqueduct, the promontory of the cochlea, and the entrance to the Eustachian tube were all recognizable. The niche between the promontory and the aqueduct, in which the stapes normally lies concealed, was occupied by granulations, to remove which a specially small curette, which might have entered the vestibule, was used.

Both large ossicles had completely disappeared.

A meato-conchal flap was turned upwards and the cavity filled with gauze. The post-aural wound was sutured and dry dressings applied in the usual way.

Subsequent Course.—The patient passed rather restless nights and vomited every day for five days—although there was no change in the pulse or temperature and the wound was free from secondary inflammation.

On the 5th day he began to complain of headache, and on the 6th day the vomiting ceased.

Nothing could be found to account for these untoward symptoms. There was no loss of consciousness, no delirium, no retraction of the head, and no change in the pulse or temperature.

On the 8th day the pain in the head was very severe, and the patient lay with his head between his hands, half buried in the bedclothes. He did not cry out, and remained perfectly conscious.

The temperature, which had been rising for two days, was now 102° ; the pulse between 84 and 100.

Otherwise no sign of value could be found to throw light on the case. The knee-jerks were equal and not exaggerated and there was no tremor or paralysis. The plantar reflex was flexor in the right foot, and a single doubtful extensor response was obtained in the left foot.

An examination of the fundus oculi was precluded by reason of the corneal opacities.

The original wound was re-opened, the middle and posterior cranial fossæ were explored by free removal of bone upwards and backwards from the mastoid. No extradural abscess could be found. The dura, which appeared perfectly healthy, was not opened. There was no fistula leading into the external semicircular canal, and nothing to account for the pain could be discovered.

This exploration failed to indicate the cause of the patient's condition; it was therefore resolved to wait for further developments and for time to collect additional clinical data—the results of lumbar puncture and of the blood examination.

These examinations were unfortunately deferred until too late, for he died next day.

A few minutes before death, he complained to his foster-mother, who sat beside his bed, of "feeling very bad in the head," and when she rose to leave him he was dead. The

heart as well as the respiration had given out, and artificial respiration was of no avail.

I made the post-mortem examination 20 hours after death, and I think the findings sufficiently important to be given in detail although this involves some repetition.

REPORT OF POST-MORTEM, MARCH 14, 1907.

Nature of Disease.—Chronic suppurative otitis media. Left side. Recent radical mastoid operation. Obliteration of the lateral sinus. Acute streptococcal labyrinthitis; perineuritis, 7th and 8th cranial nerves. (Ependymitis)—Secondary internal hydrocephalus.

DETAILS.

External.—The body was that of a moderately nourished, normally developed boy. The right eyeball was missing. In the left eyeball there was a leucoma of the cornea, with anterior synechia.

Ear, Left Side.—Behind the pinna were two wounds: (1) semilunar, over the mastoid; (2) horizontal, from the middle of the first wound towards the external occipital protuberance.

The Method of Removal of the Brain.—The cranial vault was sawn through in the supraorbital horizontal plane,¹ and the skull-cap removed; the dura and brain were then incised in situ in the same plane; the brain above this section was replaced within the cranial vault, where it was preserved intact in formalin.

The lower half of the brain was removed in sections in situ from above downward. This method enabled one to see the exact state of affairs in the posterior cranial fossa.

The Method of Examination of the Temporal Bone.—After removing the brain and reflecting the dura, the labyrinth was opened with the gouge, first the superior canal, then the vestibule, and then the cochlea. The temporal bone was afterwards detached and preserved in formalin.

¹ *Journal of Anatomy and Physiology*, 1905. "Topography of the Human Skull."

The Left Temporal Bone.—The middle ear cavity presented the usual appearance seen after the complete operation. The eminence of the external semicircular canal was free from caries. The superior semicircular canal was found to contain blood-stained fluid, and the membranous canal was very vascular and looked like a deep red filament. The vestibule contained turbid fluid: the fenestra ovalis was occupied by granulations which did not invade the cavity of the vestibule, although the foot-plate of the stapes had completely disappeared. In the larger coils of the cochlea the fluid was pale yellow, and at the apex the fluid was blood-stained. (The other canals were not opened in the fresh state.)

The fluid in different parts of the labyrinth was taken in a pipette as each cavity was opened, and afterwards examined bacteriologically by Mr. C. E. West, who found streptococci pyogenes in almost pure culture.

The Arachnoid.—In front of the anterior aspect of the left hemisphere of the cerebellum, the arachnoid tissue was distended with slightly turbid fluid, and formed a sac, somewhat hemispheric in shape, and about 3cms in diameter. This cyst-like collection of fluid completely enveloped the intracranial part of the 7th and 8th cranial nerves, from the internal auditory canal to the cornucopia in the outer horn of the fourth ventricle of the brain.

The fluid was examined bacteriologically, but no growth was obtained on culture media.

The Dura Mater.—Below and behind the internal auditory meatus, were slender plastic adhesions on the cerebellar aspect, between the distended arachnoid and the adjacent dura. There was no extradural abscess and there was no evidence of infection by the ductus endolymphaticus. The lateral sinus was occluded by pressure with gauze. There was no evidence of sepsis.

Brain.—The surface of the cerebral hemispheres, vertical and basal, was singularly devoid of fluid in the arachnoid tissue of the sulci. The brain felt much firmer and more resistant to pressure than usual; this tenseness was evidently due to the accumulation of fluid within the ventricles, for when the horizontal section was made the fluid from the lateral ventricles escaped under high pressure, spurting out for a distance

of 12 inches, and the brain regained its normal consistence. The fluid was not quite clear but very slightly cloudy. The lateral ventricles were equally distended and held approximately 5 ounces, but some fluid was lost. The 3d or 4th ventricles had also evidently been distended, for they appeared abnormally dilated even after the fluid had escaped.

There was no occlusion of the Sylvian aqueduct and no abnormality of the veins of Galen or the foramen of Majendie.

REPORT ON THE BACTERIOLOGICAL EXAMINATION.

BY MR. C. E. WEST.

(1). Cerebro-spinal fluid from the descending horn of the lateral ventricles: no growth.

(2). Fluid from the arachnoid tissue no growth.

(3). Fluid from the vestibule: streptococcus pyogenes.

(4). Fluid from the cochlea: no growth.

Fluid in vestibule, 24 hours, agar tube: organisms morphologically and culturally resembling streptococci pyogenes with slight contamination.

Fluids 1, 2, and 4: no growth in 24 hours.

COMMENTS.

The foregoing is an account of a case of acute internal hydrocephalus, secondary to infection of the labyrinth, which set in after the radical mastoid operation had been performed for uncomplicated chronic suppuration of the middle ear.

The case throws light on the occurrence of acute internal hydrocephalus in the course of *otitis media*, even when this is unattended by gross complications, such as brain abscess or meningitis.

Clinically, previous to the operation the case presented no unusual features. Nothing was found or done at the operation to make one suspect a possible labyrinthine

infection. Clinical observations were curtailed by reason of the patient's defective sight and hearing, which accounted for his infirm mental capacity.

The first untoward symptom was vomiting; this occurred every day for five days after the operation.

The vomiting appears to have been produced by the infection of the labyrinth, although at the time nothing else confirmed this view. It is scarcely possible he could have been free from giddiness. Yet of this he made no complaint.

Severe headache afterwards masked all the symptoms, and was probably produced by the increasing distension of the ventricles of the brain.

The occurrence of sudden death in cases of hydrocephalus is of course well known, but in this case, without meningitis, it was unusually sudden and unexpected.

The autopsy was of special interest and emphasized the importance of the anatomical relations of the 7th and 8th cranial nerves.

The cornucopia of the choroid plexus in the fourth ventricle extends laterally, almost enveloping the medulla, and reaches as far forwards as the sides of the olivary bodies: it is at the lower border of the pons and close to the flocculus, where the 7th and 8th nerves emerge from the medulla, that the cornucopia of the choroid plexus is intimately related to the arachnoid sheath which surrounds the 7th and 8th nerves.

Along this sheath, the inflammation spread from the labyrinth to the ventricles of the brain.

Exactly how the labyrinth became infected at the operation was difficult to conceive, but the infection almost certainly spread from the tympanum to the vestibule through the fenestra ovalis.

It is unlikely that this infection was a mere coincidence, although the stapes had been apparently destroyed by granulations which may quite possibly have been disturbed although certainly not penetrated.

The occurrence of acute internal hydrocephalus as a terminal lesion in meningitis is so common that an account of an isolated case would be devoid of interest. The feature of this case is the absence of meningitis.

With the knowledge revealed by the autopsy a brief review of the symptoms and treatment may serve as an object-lesson.

The continuance of vomiting for several days after the radical mastoid operation for uncomplicated otitis media, and especially when followed by headache, will always suggest the possibility of labyrinthine infection.

In a patient capable of understanding what is required, the tuning-fork and co-ordination tests should be carefully observed.

When we know that no opening exists in the external semicircular canal, I think we should deliberately explore the fenestra ovalis and fossula rotunda with the probe.

If labyrinthitis is present, nothing short of extirpation of the cochlea and vestibule can be considered as likely to give efficient drainage.

Had the labyrinth been opened in the present case and effectively drained, and at the same time the distended ventricles been relieved by lumbar puncture, or puncture of the brain, it is almost certain life would have been saved.

NOTE.—I am indebted to Mr. Cumberbatch for permission to record this case.

S. R. S.

A CASE OF MASTOIDITIS, WITH BRAIN COMPLICATIONS.

By FRANK KNAUSE, M. D.,

ASSISTANT SURGEON, MANHATTAN EYE AND EAR HOSPITAL.

(With Temperature Chart on Text-Plate IV. and Specimens of Hand-writing on Text-Plate V.)

John Williams age 17 years, waiter by occupation was admitted to the Manhattan Eye and Ear Hospital April 1st.

Family history and past history negative. Patient on admission gave a history of earache on the left side. Duration about a week.

Physical examination showed usual signs of an acute otitis media and he had some tenderness over the antrum and tip.

Microscopical examination of a smear preparation of the discharge following myringotomy showed the presence of a diplo-bacillus. Four days after operation he developed an œdema extending backward toward the occipital region, the auricle protruded from the skull, and there was fluctuation above and behind the same.

Operation.—The first incision opened a **subperiosteal** abscess which was traced to a perforation in the region of the zygomatic cells. Another perforation was found over the tip. The mastoid was pneumatic in structure and cells were filled with pus. The bone covering the dura in the region of the antrum was necrosed and the dura exposed over this area. Usual mastoid operation was done.

On the second night after the operation, patient felt chilly and complained of severe pain in front of and above the ear. This pain was severe enough to keep him awake and he was extremely restless and delirious at times during the night. The next day, temperature was 103°; pulse 104; respiration 24.

There was rigidity of the posterior cervical muscles with tenderness over the same. He had a well-developed Kernig's sign; no Babinski; no ankle-clonus. No areas of anæsthesia. Reflexes (cremasteric) present. Pupils equal, react to light and accommodation. No ocular or other paralysis. Abdomen not retracted. No vomiting.

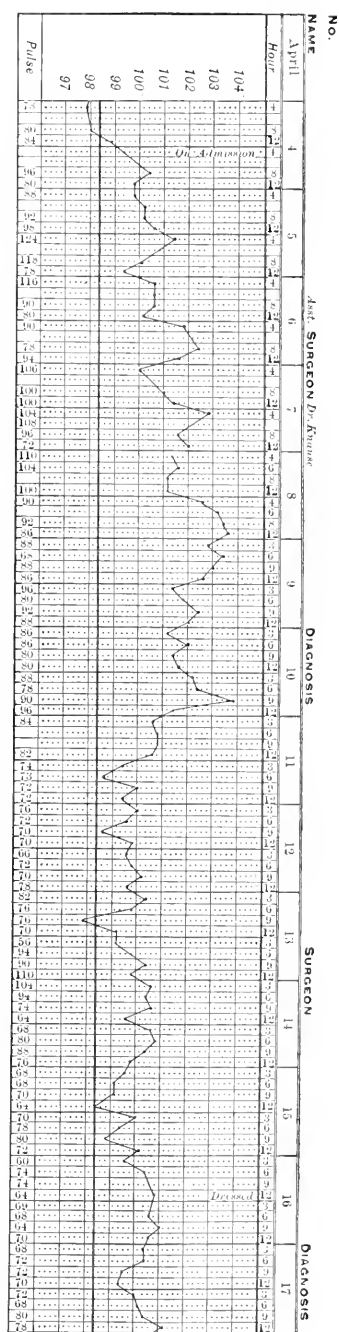
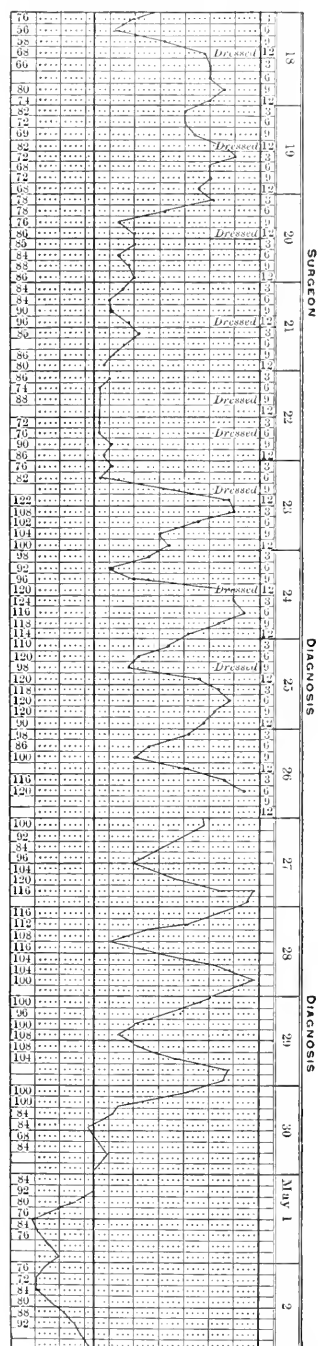
Examination of spinal fluid obtained by lumbar puncture shows slight turbidity and more polymorphonuclear cells than could be accounted for by the bleeding caused by the puncture. The fluid was not under increased pressure and no bacteria were present.

Examination of the eyes showed a beginning choked disk on the left side. Blood-count showed leucocytes, No. 7110, with 79% of polymorphonuclear cells. His mental condition was very interesting. His cerebration was slow but he did not seem delirious. Aphasia was present and limited to agraphia. He could not speak his name or call the name of such simple objects as knife, pencil, book, or coin when these were shown him. He instantly recognized the name when it was spoken and knew the uses of the different objects. He could not repeat the name after hearing it spoken. When asked to do so he would begin to count one, two, three; "one, two, three," and then say "I don't know." He indicated his desire for food or drink by pointing to his mouth. When asked to count fingers held before him he did so without difficulty. He also counted to twenty with but one mistake. He could mentally add and subtract. He could not, however, read either written or printed words, simple words like cat, pen, and knife. When asked his name he made an effort to speak it and then said, "I don't know." When shown his written name—John Williams—and asked what it was, he at once replied, "That's my name." When asked again his name he was unable to give it. When asked a number of different names he was always able to indicate his own as soon as it was spoken. He was unable to tell the name of the city in which he lived, where he was born, or anything of his family. When asked to write his name he was able to write John but not his last. (See No. 1.)

This mental condition continued with slight increase of symptoms for six days. He was in a slight stupor from

which he was easily aroused. At night he was delirious frequently. He had involuntary micturition and defecation. The highest temperature during this time was 104° ; highest pulse-rate 115. Examination of blood showed a leucocyte count of 12,000, with 67% polymorphonuclears. Fluid obtained by lumbar puncture came drop by drop through a fair-sized needle and was slightly turbid and again free from bacteria. The optic neuritis increased. He had no areas of anæsthesia. Temperature sense was lost over the whole body. Muscle sense was present and normal.

He complained of pain over the entire left side of the cranium and it was tender to the touch. On the 12th day of April, seven days after the first operation, at 9:30 A.M. he had an epistaxis, and at 10:30 A.M. a convulsion which was more tonic in character, with marked retraction of his head, and lasted about an hour. A partial facial paralysis of the right side of the face developed. The facial paralysis involved the lower branches only and he was able to close the eye on that side. The next day symptoms of increased pressure being shown by a subnormal temperature of 97.8° by rectum, pulse of 54, and respirations as low as 14, it was determined to explore him for the presence of a brain abscess. Under chloroform anæsthesia, an incision was carried forward from the upper end of the previous curvilinear incision for about $1\frac{3}{4}$ inches. Periosteum was retracted and the cortex was removed over the dura of the middle fossa, $\frac{3}{4}$ inch upward and $1\frac{1}{2}$ inches forward. The wound was washed with saline solution and alcohol. Exploratory incision was made with a long flap knife forward and upwards, forward and downwards, forward and inwards, and inward anteriorly. Posteriorly, inward and forward and inward and upward; lastly, from a point corresponding to the antrum roof directly upward. No evidence of pus followed any of these punctures. The wound bled very freely, the bleeding being controlled by packing. This bleeding prevented us from seeing the appearance of the pia arachnoid membrane. The dura appeared normal except over roof of antrum, where necrotic bone had been removed at the first operation. No dural flap was made, but incision through the dura was made with one knife and the puncture with another to prevent infecting the brain as



far as possible. There was no apparent increase in tension and no pulsation could be felt. The wound was left open, packed with iodoform gauze, and the patient returned to bed.

The next morning patient could tell his full name but could not tell the name of this city. He could not tell the largest city in England, could not speak the name knife, but instantly knew when the word was pronounced. Could protrude tongue for the first time. Facial paralysis unchanged. Pulse 84, full, regular. Mental condition improved.

April 15th: Aphasia much improved. Recognizes and gave the name of knife, his own name, told where he lived, and his folks. Could not tell his N. Y. address. Kernig's sign and rigidity of neck about the same. Facial paralysis improved. Wound showed marked œdema extending to some distance on the scalp tissues. (Middle ear was perfectly clean.) Writing showed improvement. (See No. 2).

April 16th: (Dressing done. Packing removed. Very slight bleeding. Wound healthy. No pus nor necrotic tissue. Dura not as yet showing granulations.) Patient fairly rational to-day, knows what is going on about him and asked nurse to return a pillow which had been borrowed from another patient, indicating to whom it belonged. The œdema increased to within an inch of the median line and from external occipital protuberance to external angle of orbit. Tender to touch. Eye-grounds apparently same.

April 18th: (Some secretion in the lower part of the mastoid wound. Dura covered with granulations. Dura over middle fossa bulging.) Fairly rational. Complains of pain over left side of his head, more marked at night. Writing now appeared normal. (See No. 3.)

April 19th: Wound clean. Mental condition not so good. Slow to comprehend.

April 20th: Condition about the same.

April 22d: Wound healthy. Granulations cover the entire wound. Rigidity of neck and Kernig's sign diminished. Aphasia much improved, but mental condition still dull. Facial paralysis completely gone.

April 23d: Wound clean. Œdema disappeared. Mental condition about the same. His temperature, which had been running about normal, rose to 104° and with diurnal remissions

of four or five degrees for four days,—the explanation being an erysipelas which ran its course in 14 days. Blood count at this time showed leucocytes 8440, with 70% polymorphonuclears. With the development of the erysipelas a marked change took place in his mental condition. Where before he had seemed under a cloud, now everything appeared clear mentally. He was able to converse, write his name, and read the paper fairly well. Certain words seemed to bother him, words of association such as bridge and river. He would spell either one properly, but would use bridge for river, or *vice versa*, when reading aloud from a paper, and be unaware of any error in doing so.

Patient was transferred to Bellevue Hospital where he remained for twelve days, being readmitted to the Manhattan Eye and Ear Hospital on May 7th. On readmission examination showed him to be perfectly normal as to mental condition. His memory was good and the agraphia and aphemia had disappeared. Reflexes were normal. He had no paralysis.

Examination of the left eye showed a normal retina; no remaining signs of an optic neuritis. Pupils equal in size, reacting both to light and accommodation. No oculomotor paralysis. He ate well, slept well, and was with difficulty prevented from wandering about the ward. He did not wish to stay in bed and was anxious to get back to work.

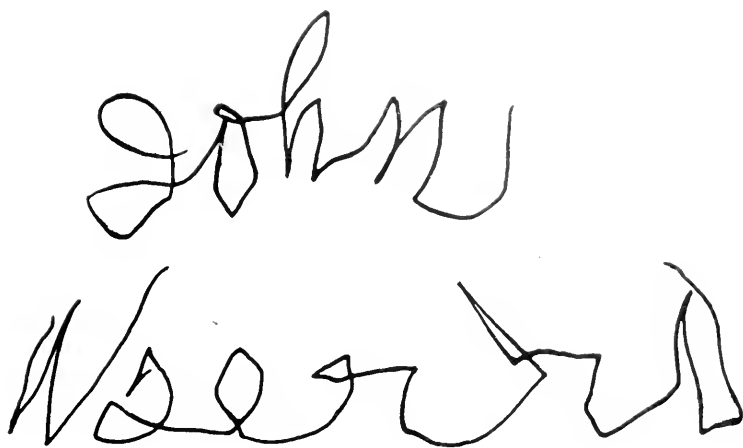
On May 20th, under chloroform anæsthesia, a plastic operation was done to correct the sagging of the auricle caused by the open treatment of the wound in the second operation, this wound having been packed instead of sutured. The result was that the erysipelas was lighted up and patient was again transferred to Bellevue for one day and then to the City Hospital. The second attack of erysipelas was of short duration and did not interfere with the healing of the plastic operation.

He was up about the ward, going out-of-doors and apparently convalescing satisfactorily when he suddenly died July 7, 1907.

Report of autopsy was as follows:

On removing calvarium the dura is very adherent to the left temporo-sphenoidal lobe. On removing the brain some

ILLUSTRATING DR. KNAUSE'S ARTICLE ON "A CASE OF MASTOIDITIS WITH
BRAIN COMPLICATIONS."

A large, stylized handwritten signature in cursive script. The first name 'John' is written on the top line, and the last name 'Knouse' is written on the bottom line. The letters are fluid and connected, with a prominent loop at the end of the 's' in 'Knouse'.

NO. 1. APRIL 10, 1907. BEFORE EXPLORATION.

A handwritten signature in cursive script. The first name 'John' is written on the top line, and the last name 'Holliam' is written on the bottom line. The letters are fluid and connected, with a prominent loop at the end of the 'm' in 'Holliam'.

NO. 2. APRIL 14, 1907. TWO DAYS AFTER EXPLORATION.

A handwritten signature in cursive script. The first name 'John' is written on the top line, and the last name 'Williams' is written on the bottom line. The letters are fluid and connected, with a prominent loop at the end of the 's' in 'Williams'.

NO. 3. APRIL 19, 1907.

of the substance comes away with the dura. Blood-vessels of the pia were markedly injected and were distended with dark fluid blood.

The left temporo-sphenoidal lobe is yellowish-green in color and very soft and mushy. On section there is a moderate amount of fluid in the lateral ventricles.

As we cut through the basal ganglia we see a large greenish-yellowish mass projecting upward. This mass seemed under a little tension and on turning the brain over it is seen to be the left temporo-sphenoidal lobe. On section of this mass about one half ounce of thick greenish pus escapes. This leaves a large cavity with large thick walls. The whole abscess-cavity seems to be walled off from the surrounding brain substance.

The spinal cord was normal. Additional lesions were: Acute, parenchymatous degeneration of the heart; acute miliary tuberculosis of the lungs; acute tubercular splenitis; acute parenchymatous nephritis with a small amount of interstitial nephritis; fatty cirrhosis of the liver.

The immediate cause of death was undoubtedly the cardiac lesion. The outline of the abscess corresponded with the kidney-shaped portion of the bone which had been removed from the skull, and the external wall of the abscess was not more than $\frac{1}{4}$ to $\frac{1}{2}$ inch in thickness.

The convolution of Broca showed no macroscopical changes.

Some of the interesting features of the case are:

(1) Was the abscess of the brain present at the time of exploration?

(2) Were the symptoms due to a localized meningitis and the abscess the result of our exploratory operation?

(3) That while he had aphemia and agraphia there was no difficulty as to his perception of numbers.

(4) The rapid disappearance of symptoms following the local bloodletting.

REPORT OF A CASE OF MENINGITIS OF OTITIC ORIGIN; OPERATION; RECOVERY.

By PHILIP D. KERRISON, M.D.,

CLINICAL LECTURER ON DISEASES OF THE EAR, UNIVERSITY-BELLEVUE
MEDICAL COLLEGE, NEW YORK

Mr. C., 34 years of age, was first seen by me on June 5, 1907, in consultation with Dr. Bruce Phillips.

The previous history is that of a discharge from the left ear, constant, scanty, offensive, which dates back to, and has persisted since, early childhood. For some years, the discharge has rarely been sufficiently profuse to cause great discomfort, and the patient has learned to cleanse the ear by wiping it out daily with sterile cotton wound about a wooden applicator.

I am indebted to Dr. Phillips for the following history of the onset of present attack. On Monday, June 3, 1907, the patient developed severe left earache,—so severe that he was directed to go to bed, and frequent hot irrigation of the ear was advised. On the following day, Tuesday, the earache was less severe, and toward evening was so far relieved that the patient, who is a lecturer in one of the Universities, got out of bed and attempted to look over some examination papers. On the following morning (Wednesday) Dr. Phillips was again called to find the patient obviously seriously ill. The chief symptoms at this time were fever, severe occipital headaches, and frequent vomiting. It was at 2 o'clock on this, the third day of the attack, that I was called in. He was vomiting when I arrived; his face was pale, cool and clammy, and drawn into an expression of pain. Rectal

temperature however registered 103° . Pulse 120 and rather thready. Pupils somewhat contracted but reacted to light. Mental condition dull, in that questions put in an ordinary conversational tone were answered without understanding or not at all. But by asking a simple and direct question in rather loud and insistent tones he could be aroused to answer intelligently. Thus to the question where he felt pain, he repeatedly and definitely located this in the back of his head.

Examinations of the Ears.—Right ear normal. Left ear, membrana tensa practically destroyed, tympanum containing granulations and a small amount of offensive pus.

Blood count by Dr. Sondern showed a leucocyte count of 22,800, and a polymorpho-nucleophile count of 88 per cent.

Patient was removed the same afternoon to the Manhattan Eye, Ear, and Throat Hospital. On admission at 4 P.M. the temperature had fallen to 101° , rising two hours later to 102° . Pulse 126. Patient practically unconscious,—*i.e.* it was no longer possible to communicate with him. Pupils very much contracted, so that Dr. Van Fleet found it impossible to examine the eyes until the local effect of belladonna had been obtained. No ocular changes were found present. Rigidity of the muscles of the back of the neck was now unmistakable. Other muscles not rigid. Reflexes not noticeably increased. Patient's condition now more nearly approached coma, in that though restless he was apparently oblivious to everything occurring about him. Dr. Whiting, in consultation, confirmed the diagnosis of cerebral meningitis and informed the patient's family that in his opinion the only chance of recovery lay in immediate operation. In this opinion Dr. Van Fleet and Dr. Bruce Phillips, his physician, concurred.

The question of lumbar puncture was discussed and was advised against on three grounds, viz: (1) that the diagnosis seemed clear without it; (2) that the disease was of too recent development for probable changes in the spinal fluid; and (3) that the procedure constituted a possible additional strain upon the patient and seemed to offer no positive therapeutic advantage.

Operation.—Usual post-auricular incision. This later was

augmented by a second incision commencing near the upper end of the first, and curving first upward and backward and then forward so as to form a flap, deflection of which exposed the outer wall of the mid-cranial fossa. Mastoid of sclerotic variety,—apparently eburneated throughout. Antrum deeply seated, small, and found to contain thick, creamy, ill-smelling pus. No perforation of tegmen antri demonstrable. Roof of antrum removed with chisel. Beginning from this point, the squama covering the temporo-sphenoidal lobe was next removed over a space extending from before backward about three inches.

Appearance of Dura.—Removal of bone here caused the dura to bulge considerably, showing decided increase in cerebral pressure. No pus between bone and dura was present, and no exudate was noticeable. Dura was congested, surface vessels being apparently engorged, and a few small areas of capillary injection being present. The dura was now opened by three parallel, vertical incisions about one inch in length and one inch apart. Considerable oozing of cerebral fluid followed. A grooved director was now introduced into the lower end of the anterior incision and carried directly into the substance of the brain for about two inches. The director was then withdrawn and introduced successively through the lower ends of the middle and posterior incisions. In the last situation the director was carried inward and somewhat backward to a depth of about $2\frac{3}{4}$ inches, and was followed by a considerable flow—not a gush—of cerebral fluid. The director was next introduced in exactly the same way through the upper ends of the three incisions, making six perforations of the brain in all. *This completed the operation.*

No attempt was made to introduce a drain of any kind into the brain or into the dural openings. Loose sterile gauze was placed in contact with the exposed dura, this being covered by a large sterile absorbent dressing.

On the following morning the patient's condition was as follows: Temperature at 9 A.M. 98.6°, pulse 78. The dressing and part of the pillow case were saturated with cerebral fluid. The patient was exceedingly restless and complained of severe headache. The mental condition, however, was clear. Asked if he felt better than the night before, he replied

promptly and positively that he did not;—that on the previous evening he had been “sitting up and examining students’ papers,” showing that his stay in the hospital previous to the operation represented a blank in his experience. Toward evening the condition again became somewhat alarming. The temperature rose to 102.8°. He complained of unbearable pain in the back of the head and along the spine, and his restlessness was such that the nurses had difficulty in keeping him in bed. This condition was controlled by morphine. The following morning found the patient more comfortable, and from this time there were no symptoms which seemed especially alarming. During the following ten days there were regular evening rises of temperature, which then reached and kept the normal line.

The progress of wound repair was watched with care as furnishing a possible indication for the final closing of the wound. By the end of the first week granulations were forming along the lines of the dural incisions, and soon covered the whole dural surface. The loss of cerebro-spinal fluid, however, continued long after the dural incisions were hidden from view. While this persisted the wound was kept open by interposing pads of gauze between the dural and the under surface of the flap. The wound was finally apposed and sutured on July 15th, about six weeks after the operation.

To me this case has been instructive chiefly in suggesting the following facts bearing upon the management of such cases:

(1) That drainage of the subdural spaces may be obtained by simple dural incision, and does not require the introduction of wicks or artificial drains of any kind.

(2) That by the method followed in this case drainage of the lateral ventricle may be established without subjecting the brain or meninges to any injury likely to result in cerebral herniæ, or subsequent cerebral or meningeal infection.

(3) That following such an operation the wound exposing the dura should not be allowed to close until

the loss of cerebral fluid has practically ceased. Such delay not only insures against sudden increase in cerebral pressure, but provides a barrier to cerebral infection in the protecting layer of firm granulations which has formed.

NOTE.—Among the symptoms one would expect in meningeal disease in which both cerebral and spinal meninges are involved, and which were absent in this case, are strabismus, general muscular rigidity, Kernig's symptom. I am inclined to believe that had we waited another twenty-four hours, one or more of these symptoms might have been added, and that the diagnosis might have been further sustained by the death of the patient.

THE "PIANO-STRING" THEORY OF THE BASILAR MEMBRANE.

By W. SOHIER BRYANT, A.M., M.D., NEW YORK.

IS the basilar membrane so constructed that its fibres can vibrate sympathetically to all the tones within the limits of hearing?

If the fibres of the basilar membrane are to vibrate sympathetically to all tones within the limits of hearing, two things must be true of them: (1) There must be enough of them. (2) Their lengths, tensions, and mass must be such that some of the different fibres must be capable of from 12 to 25,000 double vibrations per second. (These are the limits of audition.)

First, as regards the number of fibres in the basilar membrane: The maximum number which has been estimated is 24,000.¹ PREYER says: "Musicians can distinguish with certainty a difference of pitch arising from one half vibration per second in the doubly accented octave." If this is the case, there must be at least one fibre that vibrates, say 256 times per second, and another that vibrates $256\frac{1}{2}$ times per second.

Assuming that this is true only within the limits of the musical scale (about 24 to 3000 whole vibrations per second), and allowing one fibre for each half vibration within these limits, and a single fibre for each whole vibration beyond these limits (*i.e.* from 12 to 24 and from

¹ HENSEN and C. HASSE. Quoted by the author in BURNETT's *System*, p. 72. Also RETZIUS.

3000 to 25,000 whole vibrations), there should be about 28,000 fibres. But since in the region of the highest tones probably no person can distinguish a difference of pitch of even a whole vibration, this number is undoubtedly considerably greater than the actual number of fibres necessary; and hence it corresponds closely enough to the estimated number of fibres (24,000) to make the theory of the sympathetic vibration of the basilar membrane plausible.¹

But an investigation of the other conditions must be made before accepting the theory. That is, we must find out whether the lengths, tensions, and mass of the fibres are such that the different fibres may make from 12 to 25,000 whole vibrations per second. When a string is fastened at both ends and made to vibrate, the number of vibrations which it makes per second depends upon the length, tension, and mass per unit length of the string, the exact relation being expressed by the formula:

$$n = \frac{1}{2L} \sqrt{\frac{T}{m}}$$

where n is the number of vibrations per second; L , the length of the string; T , its tension; and m , the mass per unit length. In our problem, n varies from 12 to 25,000, and the length of the fibres in the basilar membrane, (that is L) varies from .041mm near the lower extremity to .495mm at the apex.² Substituting these extreme values in the formula and assuming that the tension is uniform throughout the whole membrane, we can find what relation must exist between the mass per unit length of the first and last fibres of the membrane. This relation is about 1:30,276! On the other hand, if we assume that the mass per unit length is the same in all the fibres,

¹ A. DENKER, "Die Membrana Basilaris im Papageien-Ohr und die Helmholtz'sche Resonanztheorie." *Festschr. J. Rosenthal*, Leipzig, 1906, i., pp. 277-285.

² HENSEN and C. HASSE. Quoted by the author in BURNETT'S *System*, p. 91.

then the relation between the extreme tensions must be 1:30,276! And finally, if both the mass and the tension vary, then the products of the extreme values of both must be in the ratio of 1:30,276! All of these conclusions are not only improbable but impossible, and hence the theory of the sympathetic vibration of the basilar membrane will not stand under close analysis.

A further objection to the "piano-string" theory is that the basilar fibres cannot fulfil the requirement of a resonating body on account of the load of tissue attached to them, and further there are several layers of fibres running in different directions in the membrane as shown by H. Ayres.¹ Shambaugh² has shown that the organ of Corti in the pig's ear exists independent of both the basilar fibres and basilar membrane.

The above physical conditions seem to negative the Helmholtz "piano-string" theory. Shambaugh's theory of the sympathetic vibration of the fibres of the tectorial membrane is physically impossible, because the structure of the membrane would preclude any sympathetic vibration to many tones. These deductions make it most probable that the sensitive hair theory which I am investigating may prove to be the true theory.

CONCLUSIONS: 1. *The basilar membrane is not essential to the organ of Corti, and, when present, is not furnished with the requisite length and mass of fibres to vibrate in sympathy with every note even if the rest of the structures would allow it.*

2. *Further the basilar membrane is devoid of the requirements of a resonating body.*

3. *HELMHOLTZ'S "piano-string" theory of musical preception is without foundation in every particular.*

¹ H. AYERS, *Journal of Morphology*, vol. vi., No. 1, 1892.

² SHAMBAUGH, "Restudy of the Minute Anatomy," etc., *American Journal of Anatomy*, vol. vii., No. 2, p. 245, Aug., 1907.

SARCOMA OF THE MIDDLE EAR.

By ALEXANDER ZEBROWSKI, M.D.

THE malignant tumors of the middle ear are observed on the whole very rarely. The number of the middle-ear sarcomata described is less than fifty; the number of the sarcomata which developed in any part of the organ of hearing is less than 100, although this malignant tumor can develop in all parts of the ear, in the concha, in the external ear canal, in the drum-cavity, in the mastoid, and at last in the labyrinth and auditory nerve. In consideration of the rarity of this disease I will describe a case of sarcoma of the middle ear, which is remarkable in many instances. This case I observed and operated upon in 1905, in the ear department of the military Ujardow Hospital, in Warsaw.

The literature of this subject until 1896 is to be found in an excellent monograph by P. ASCH,¹ who gathered all cases published up to this time and added three cases of his own of the middle-ear sarcoma. The statistics of P. ASCH in regard to the frequency of the separate parts of the ear affected are as follows:

Sarcoma of the concha	10 cases.
“ “ “ external Canal	3 “
“ “ “ middle ear	50 “ (about).
“ “ “ labyrinth	20 “ (about).

¹ “Das Sarkom des Ohres.” Inaugural Dissertation der medizinischen Fakultät der Universität, Strassburg, von PAUL ASCH, 1896.

In the accessible otological literature from 1896 I have found only three cases of middle-ear sarcoma. They are two cases of W. MILLIGAN¹ (both females, 36 and 18 years of age), and one case described by DR. E. OPPIKOFER² (a child, 8 years old). All these cases were operated upon with fatal results.

Description of the Case.

I. N., soldier, 25 years of age, native of Poland, a tall, very anæmic and apathetic man. The apathy and the pale color of the skin are striking. The internal organs are normal. Pulse 92, temperature 38° F. The tones of the heart are feeble but pure, profuse, purulent bad smelling discharge from the left ear. The left auditory canal is filled with a growth, which bleeds on touching with a probe. It is impossible to find the place, where the growth springs from, because its base occupies nearly all the drum cavity. In the left mastoid region is a tumor about the size of a hen's egg, tender on pressure, which goes down the neck to the *cartilago thyreoidea*. In this place, on the neck is a small wound (5 cm in length, 3 cm in breadth) is to be seen, covered with reddish soft granulations. *Total palsy of the left facial nerve.* In the nasopharynx is a large quantity of adenoid vegetations (?), which are exceptionally soft and bleed on touching with the finger, the voice and respiration are, however, without alteration. The right ear is normal. In the left ear the hearing is diminished (whisper by the ear), Rinne—, Weber+.

The patient remarked that the tumor had been growing about eight months, but he cannot tell exactly when the palsy of the facial nerve first appeared, how long he had had the purulent discharge from the left ear, or what happened earlier—in short, it is impossible to collect any definite history. Two months ago, because of a "boil" on the left

¹ "Zwei Fälle von Sarkom des Mittelohres." W. MILLIGAN.—*Zeitschrift für Ohrenheilkunde* B. 30, p. 226.

² DR. E. OPPIKOFER. "Annual Report of the Oto-laryngological Clinic and Polyclinic in Basel: Sarcoma of the Right Middle Ear, involving the Labyrinth and Both Cranial Fossæ. Operation. Death," ARCHIVES OF OTOTOLOGY 1905, p. 291.

side of the neck, he was operated upon by the field-surgeon, who made an incision in the "boil," but found no pus.

On August 14, 1905, I performed, under chloroform anæsthesia, the following operation. At first I removed the growth in the left drum cavity. After removing the growth the drum cavity was examined and total absence of the drum membrane and both ossicles was noticed. The drum cavity was filled with granulations, which were carefully removed with a small sharp spoon. Then an incision was made over the mastoid from the temporal line to the wound on the neck. A large cavity was found extending from the tip of the mastoid, *angulus mandibulæ* to the *processus transversus atlantis* which was filled with soft gray masses, which were easily removed with the spoon and with the finger. The *fascia colli profunda processus transversus atlantis* and *angulus mandibulæ* were to be seen as in anatomical preparation. By separating of the concha it was noticed that the concha was almost totally separated from the temporal bone by the destructive process and that the posterior upper part of the external ear canal was also destroyed. Because of these pathological alterations the performance of the radical operation was relatively easy. The mastoidectomy showed that some cells of the mastoid and the antrum were filled with soft granulations similar to the growth in the drum cavity, over the mastoid, and in the neck. The masses of the tumor did not pass into the skull cavity; the *lamina vitrea* was not involved, therefore I did not open the skull. After removing all pathological parts and after performing the radical operation, the large wound in the neck and in the mastoid region was filled with iodoform gauze and the usual dressings were applied.

August 15, 1905. The general condition of the patient was much better. The tenderness on the left side of the neck had disappeared. Temperature 36.8° pulse 80, change of the dressing shows that the wound is clean, no pus. The dressing is made every day and after a week I observed that the regeneration of the tumor had already begun, at first in the form of the small feeble granulations, which increased very quickly. At the same time on the left shin bone I perceived under the skin a tumor as large as a pigeon's egg. I removed this without difficulty under cocain-anæsthesia and

examined it under the microscope, together with the growths in the drum cavity, in the neck, and in the antrum. The examination showed the absolute identity of all these parts of the tumor—it was a *sarcoma globocellulare*. All these tumors have just the same microscopical structure. Very large quantity of the round cells and small quantity of binding tissue. In the following course of the disease, the tumor increased very rapidly in the neck and in the drum cavity, which after several weeks was again totally filled with the growth. The temperature was normal only during the first six days after operation—the following post-operative course of the disease was with a high fever (38.8° – 39.3°) and a pulse continually more than 100. Daily dressings were applied. The patient was always apathetic and for some days before death complained of headache. Death occurred suddenly seven weeks after operation, when the patient was sitting on his bed early in the morning.

Post-Mortem (extraction from the section record). All lymphatic glands on the left side of the neck and three glands on the right side are enlarged, soft, of grayish color. The nasopharynx is filled up with the same growth. The tumor had destroyed part of the sphenoid bone and joints of the occipital bone. The *processus odontoideus* had entered into the skull cavity and had destroyed the medulla. Edema of the brain. In the right lung, four metastases of the tumor, each about the size of a pea. In the muscle of the left ventricle of the heart one metastasis 5cm long and 5cm broad and 2cm thick. In the pericardium about 1000cc of reddish, muddy fluid. Dilatation of the heart. The postoperative wound in the neck from the radical operation is filled up with the soft reddish granulations. The *malleus* and *incus* are not present. The facial nerve in the bone is surrounded with the granulations but the canal of the seventh nerve is not opened. Labyrinth macroscopically is normal.

Diagnosis anatomica: Lymphosarcoma colli, ossis temporalis et corporis ossis sphenoidalis cum metastasis in pulmone sinistro et in corde. Pericarditis seroso-fibrinata. Destructio medullæ oblongatæ per processum odontoideum vertebræ secundæ.

The clinical course and the result of the section in my case suggest many critical remarks, concerning the etiology, diagnosis, and operative treatment of the middle-ear sarcoma. In regard to the absolutely obscure question of the etiology of the malignant tumors in general, the primary cause, which produces the malignant growth in the ear is still unknown. ASCH, in his dissertation endeavors to find the causal connection between the jellied mass, which is to be found in the middle ear of the new-born and the relatively often appearance of the myxosarcoma of the middle ear in childhood; the small number of the cases does not allow any positive conclusion to be made in this direction. Moreover, HÖLTSCHE had demonstrated that in the drum cavity of the new-born there is no jellied mass, but a thickened mucous membrane. The purulent discharge from the ear, which occurs without exception in all cases of cancer of the middle ear was given as an etiological agent of the malignant tumors of the middle ear. STURM,¹ after describing a case of a primary cancer of the temporal bone with suppuration in the drum cavity of many years' standing brings us to the analogy between the forming of the cancer in the fistula of the long bones (for instance shin bone) and in the temporal one. The chronic suppuration of the middle ear, when the drum membrane is perforated near its margin ("randständige perforation") evokes the growing of the epidermis into the drum cavity and its metaplasia, hence the origin of the flat epithelial cancer in the middle ear, although in the drum cavity the flat epithelium is not present. With regard to the sarcoma, it seems that the precedent suppuration from the ear is not a necessary condition for the appearance of the tumor. HARTMANN² had observed

¹ STURM, "Zur Kenntniss des primären Plattenepithelkrebses im Schläfenbein," *Zeitschrift f. Ohrenheilkunde*, vol. 40, p. 276.

² ARTHUR HARTMANN, "Ein Fall von Rundsellen Sarkom von der Trommelhöhle," *Zeitschrift f. Ohrenheilkunde*, vol. 8, page 213.

a case of middle-ear sarcoma in a child, three years of age, without purulent discharge from the ear. For the most part, however, in the cases of middle-ear sarcoma the suppuration from the ear had been noticed (CHRISTIANECK, MILLIGAN, ASCH, *A. f. O.*). In my case it is impossible to determine if the purulent discharge had existed before the appearance of the tumor or was produced by it. At any rate the suppuration from the ear must be taken as an agent which favors the production of the malignant tumors and therefore must be carefully cured: that is the sole prophylactic measure which can be used against the malignant tumors of the ear.

The large destruction of the skull bones and the malignant degeneration of the lymphatic glands in the nasopharynx and in the neck, in my case, makes it doubtful whether it was a primary sarcoma of the middle ear, or perhaps a secondary or metastatic tumor. The early palsy of the facial nerve is a characteristic symptom of a primary sarcoma of the middle ear. ASCH affirms after consulting a relatively large number of cases from the literature, that in the differential diagnosis between primary and secondary sarcoma of the middle ear the facial palsy is of great importance because it occurs only in the cases of primary middle-ear sarcoma.¹ The microscopic examination of the growth in the drum and antrum cavities which had shown that it was a sarcoma speaks also for the primary origin of the tumor in the middle ear.

The diagnosis of the primary or secondary sarcoma of the middle ear is difficult. In absence of the facial palsy, and of the tumor in the mastoid region the idea of such a hopeless disease will arise when all of these other symptoms are present. Only the microscopical

¹ "Bei der Differenz von primären und sekundären Sarkom wird man, sofern Zweifel bestehen sollten, an das Fehlen der für das erstere so charakteristischen Facialislähmung bei dem sekundären Sarkom denken,"—ASCH, p. 59.

examination of the granulations in the drum cavity, which after removing grow afresh in a short time, can clear up the question. The cases from literature demonstrate that the sarcoma of the middle ear can appear as a complication of another also grave and dangerous disease, for instance, of a cholesteatoma of the ear (second case by W. MILLIGAN) and is not recognized early. In short till the present day we don't know the cases of the middle-ear sarcoma which were diagnosed sufficiently early for the favorable result of operative treatment. It is evident, that if the tumor had destroyed nearly a half of the skull, every rational operative treatment is impossible. Even the most extensive radical operation with removal of all pathological parts is only palliative; this operation in my opinion must be, however, performed in all cases of the middle-ear sarcoma, for it is the *ultimum refugium* and it is not impossible under favorable conditions to secure even many years without regeneration. ALEXANDER¹ in the last article describes nearly total resection of the temporal bone. If the technical performance of this operation can be improved perhaps the malignant tumors of the middle ear will be accessible for operative treatment as are the malignant tumors of the larynx.

In a manner the immediate cause of death in my case is interesting. This cause was the falling of the *processus odontoides* into the skull cavity and destruction of the medulla the death occurred suddenly. This at all events unusual phenomenon was made possible through an extensive destruction of the articulations of the occipital bone. Usually the death occurs as a consequence of marasmus (cachexia) which develops very rapidly, even more rapidly than in the cancer of the middle ear.

¹ *Monatsschr. f. Ohrenheilkunde*, vol. 41, p. 344.

A CASE OF LARGE CHOLESTEATOMA OF THE
MIDDLE EAR AND THE POSTERIOR
CRANIAL FOSSA, CURED BY RADICAL
OPERATION. NO RECURRENCE AFTER
EIGHT AND ONE-HALF YEARS.

By C. ZIMMERMANN, M.D., MILWAUKEE, WIS.

(Demonstrated before the Medical Society of Milwaukee County,
March 8, 1907.)

ON the patient I am going to present to you this evening, I performed the radical operation for cholesteatoma of the middle ear and the posterior cranial fossa eight and one-half years ago. Ever since he has enjoyed perfect health and has been able to devote himself uninterruptedly to his work as a farmer. He visited me this morning, and I am glad to have the opportunity to show him to you, as his case demonstrates a perfect and lasting cure of cholesteatoma which, according to experience, can only be considered safe after a long time.

With regard to the nature of the disease, I ask your permission to quote from my paper, in ARCHIVES OF OTOLOGY, vol. xxix., No. 4, 1900, p. 290, and from recent literature. Cholesteatoma of the ear is a globular tumor of the size from a grain to that of a hen's egg, of bluish-white or yellowish color, and a lustre like mother-of-pearl. Its cortex shows the structure of epidermis, and its substance consists of products of the latter, *viz.*, cornified scales, which form concentric lamellæ, like an onion. The central portions frequently contain cheesy detritus from

decaying epithelia and thickened pus, and between the lamellæ are found crystals of cholesterine, fat granules, and micro-organisms, sometimes giant cells. Its seat of predilection is the middle ear, chiefly the attic, aditus ad antrum, and the mastoid process.

There is some discrepancy of opinion as to the origin of the disease. Most pathologists identify cholesteatoma of the ear with that of the pia mater and cranial bones, which are considered as regular heteroplastic new-formations, developing, at the time of the separation of the medullary tube (Bostroem), from displaced embryonic cells like dermoids or atheromata (Mikulicz), or from detachments of epidermis of the first branchial arch (Kuester). Although the epidermoidal character of cholesteatoma had been assumed by Remak, Billroth, Ziegler, Mikulicz, Ponfick, Ribbert, and others, the strict proof for it was furnished by Bostroem in 1897, who proposed the term "epidermoid" for cholesteatoma. His investigations showed that the lining of the cholesteatomatous sac consisted of all the characteristics of epidermis, *i.e.*, in typical succession, of layers of basal cells, of granules, and a corneal stratum and eleidin granules peculiar only to epidermis. According to Scholz, who verified this condition in two cases from the pathological institute of Ponfick at Breslau (*Virchow's Arch.*, vol. clxxxiv., p. 255, 1906), the assertion of Borst, Dürck, De Stella, and others, that cholesteatoma was of endothelial origin, has not been proved so far. On the contrary, in several cases (Beneke, Scholz) which had been described as endothelial formations (developing from the endothelium of the meninges or ventricles), careful controlling after-examinations revealed these as epidermoidal tumors. Scholz also shows the fallacy of those who assume a metaplasia of mesodermal elements, *viz.*, endothelia, into epithelia as being against the law that a metaplasia only takes place between histogenetically identical tissues (Ribbert).

Some otologists, *e.g.*, v. Törlsch, Schwartz, Panse, Grunert, and others, however, find this kind, the primary cholesteatoma of the ear, to be extremely rare, and consider the occurrence of cholesteatoma in the ear as secondary to chronic purulent otitis, which is always present in cholesteatoma, and caused by a conversion of cylindrical epithelium into pavement epithelium, or, most frequently, by an immigration of epidermis, and therefore call it pseudo-cholesteatoma, otitis desquamativa. Habermann observed clinically and proved histologically the continuous growing of epidermis of the external meatus into the middle ear through perforations of the *Mt* or meatus. Schwartz in his historical remarks on cholesteatoma of the temporal bone (*Archiv f. Ohrenheilk.*, vol. liv., 1901, p. 139) says: "Through Habermann the growing of epidermis into the middle ear is now proved as cause of the formation of cholesteatoma dependent upon certain anatomical conditions and thus the development of cholesteatoma on the pathological lining of the middle ear for many, perhaps the great majority of cases, explained in a plausible manner. Only for a small portion of them, in which a tumor is found in the middle ear without preceding suppuration and without the possibility of epidermis growing in from the external meatus, we need for the explanation of the genesis of the tumor, which then must be considered as heterologous, the assumption, first made by Buhl, of a congenital foundation, *viz.*, a separation of pavement epithelium in the embryonic period of development." According to the most favored seat of cholesteatoma in the attic, this process chiefly takes place through perforation of Shrapnell's membrane above the *Mt* proper, but the same has been observed at other portions of the *Mt*. Apparently after long-standing suppurations the cylindrical epithelium loses its faculty of regeneration, so that the epidermis, which is very resistant against the destructive influence of pus, spreads readily to places

formerly covered by cylindrical epithelium. This alone, however, would not lead to the formation of cholesteatoma since we observe such an epidermization as the result of permanent healing of purulent otitis media with large defects of the *Mt*, and therefore consider its development as very desirable. There must be some other reason for the formation of cholesteatoma which lies in an impediment of disposing of the cornified epithelium, and in an increased production of it. Panse (*Haug's Klin. Vortr.*, vol. ii., p. 4) observed a slow migration of cast-off epithelial scales from the tympanic cavity of a patient on whom the radical operation had been performed, and he attributes this, as well as the excretion of scales and cerumen from the normal ear, first, to the movements of the lower jaw in mastication and, secondly, to the existence of a free passage. If, owing to peculiar anatomical conditions, the anterior wall of the meatus cannot be influenced by these movements, we have a predisposition to the formation of ceruminous plugs in the normal ear, or, if after preceding inflammations bands have developed which produce recesses and obstruct the passage, an accumulation of epithelial cells will result. The proliferation of epithelial cells is caused by inflammation, in consequence of irritations that reach the ear from outside, as water, instillations, etc., or the persistence of chronic suppurations in other portions of the tympanic cavity. The epidermic masses become imbibed with fluid, swell, and decay to very offensive material, and create inflammations of the surrounding tissues, periosteum, and bones, leading to caries and osteosclerosis. Even the accumulation of cornified cells alone is sufficient to destroy the bones by pressure, like an aneurysm. This is characteristic of cholesteatoma, and is caused by interference with the nutrition of the bone in consequence of compression and thrombosis of the vessels of the Haversian canals. Thus the recesses of the middle ear may be converted into one

large cavity, and the dura mater exposed to a great extent.

Kuhn, Koerner, Kümmel, and others, however, maintain that this view, that almost all cholesteatomata of the ear be due to an immigration of epidermis is not a warranted generalization, and is in sharp contrast with frequent operative findings, especially in children, which disclosed immense cholesteatomata after ear suppurations of such brief duration, that their development from immigration and proliferation of epidermis appears impossible. Koerner found that the least number of cases of epidermic immigration produce masses in the form of tumors like real cholesteatoma.

Cholesteatoma is a chronic disease which may last for many years without disturbing the general health of the patient. It is a complication of chronic otorrhœa in a proportion of 1:5 (Bezold). Schwartz (Chirurg. Krankh. des Ohres, p. 225) found that cholesteatoma occurred frequently in tuberculous and scrofulous individuals. Konietzko (A. f. O., vol. lix., 1903, p. 206) says that a diseased base of epidermis grown in the middle ear is a *conditio sine qua non* for the formation of cholesteatoma. He reports a case from Schwartz's clinic in which a proliferation of epidermis had taken place over a tuberculous mucous membrane of the middle ear. This is emphasized, as Scheibe asserted that in tuberculous processes of the middle ear cholesteatoma as a rule does not form. Böke (A. f. O., vol. lviii., 1903, p. 228) attributes the development of cholesteatoma to tubercle bacilli in a case in which the microscope revealed crystals of margarin and cholesterine, pavement epithelium, partly preserved, partly detritus, fat cells and cell rudiments, tubercle bacilli in the cheesy mass and in the pus of the fistula. This mass yielded cultures of bacillus lactis aërogenes, staphylococcus pyogenes aureus, and proteus vulgaris. He also found tubercle bacilli in another case. Koerner (page 111) saw immigration of

epidermis most frequently after scarlet otitis, never in tuberculous suppurations of the ear.

The *diagnosis* is made from the presence of stratified epithelium in the middle ear, which may be brought forward with the tympanic syringe or with the probe. But very often the distinction between true cholesteatoma and pseudo-cholesteatoma is hardly possible. Koerner enumerates eight points of anatomical and clinical characteristics for the differential diagnosis between both affections, but says that the cases not clear in their genesis, generally differ in their clinical aspects much more markedly from the immigration of epidermis than from true cholesteatoma. Therefore they so far must be considered and treated as true cholesteatomata (*Die eitrigen Erkrankungen des Schläfenbeins*, Wiesbaden, Bergmann, 1899, p. 110).

If left to itself, the *prognosis* is very serious on account of cerebral complications, which will result from the progressive wasting of the bone. As pointed out by Scholz, the epidermoids of the brain (which are always in connection with the pia mater, and of which two-thirds are situated at the base or close to it), are by themselves benign tumors, but, on account of their inaccessible seat and the impossibility of early diagnosis from lack of definite symptoms, they may not be operable and then become fatal. Then the tumor itself is not the cause of death, but the subsequent acute hydrocephalus, as shown by a case of Hirtz (*Bulletins de la société anatomique de Paris*, 1875, p. 254), in which a cholesteatoma of the size of a hen's egg had totally compressed the vena magna Galeni. Likewise may the absence of external signs of inflammation in cholesteatoma of the ear hide immense destructions going on within the mastoid process and the neighboring cranial cavities and thus procrastinate timely operative interference. Ephraim (*A. f. O.*, 1902, vol. liv., p. 244) observed after operations for cholesteatoma new formations of yellowish white

lamellæ in the cavities and after their removal the underlying layer reddened, and considers the malignancy of cholesteatoma due to its tendency to local destruction, not to its general influence on the organism. This however seems gradually to disappear as the inflammatory formative irritation ceases with the removal of pyogenic material. According to Kümmel (*Handbuch der prakt. Chirurgie von v. Bergmann & v. Bruns*, 3. Aufl., 1907, p. 388), the prognosis of both affections (true and pseudo-cholesteatoma) is different. The extensive destructions of the bones by a true cholesteatoma lay open the cranial cavities to a large extent and, if an inflammatory process finds its way through them, lead indirectly to an intracranial complication. A large number of the observed affections of the brain and sinus after otitis is due to cholesteatoma. The desquamative otitis is, by the ulcerations of the bone very regularly accompanying it, occasionally followed by such complications, but more rarely than true cholesteatoma.

The *treatment* consists in removing the cholesteatomatous masses, and in healing the purulent otitis media. This may be done from the meatus, if the cavity is only small and can be inspected. If not, the whole middle ear and mastoid have to be opened, so that the cavity can be examined all over and thoroughly cleansed. The operation is only the commencement of the treatment. The changes of dressing are of paramount importance for procuring epidermization of the cavities. The developing granulations have to be dealt with in the proper way by tamponade and, if necessary, by cauterization. As soon as the antrum is covered with epidermis, the postauricular opening may be allowed to close, so that finally the whole cavity is nothing but an extended ear canal. Some operators close the external wound primarily. If, however, the cholesteatoma and the cavity, remaining after the operation, are very large, it is sometimes not possible to close the postauricular opening, as

in a case I saw in the clinic of Dr. Lermoyez at Paris, where almost one whole side of the head was occupied by the cavity, or, since cholesteatoma has a great tendency to relapses, it may not be advisable, so that the cavities remain open for inspection, and can be kept clean, which *e.g.*, in our case could not have been sufficiently accomplished from the entrance of the ear.

This *course of treatment* has been adopted in this case of a man, now aged 36 years. He came to me March 30, 1897, and presented the following condition:

Left ear: Very large masses of polypi projecting from external meatus. Offensive discharge; extensive necrosis of middle ear. Removal of polypi, scraping and cauterization of the diseased walls.

Right ear: A large polypus springs from the posterior wall of the tympanic cavity. Attic filled with offensive cholesteatomatous matter, which was removed. After-treatment until July, 1897.

October 28, 1898, he returned, very much emaciated, with the history that about a month ago an abscess had formed on right side of neck. A fistulous scar, one inch in length, commencing one and a half inches below the tip of mastoid, ran down along the sterno-cleido-mastoid muscle (Bezold's mastoiditis).

Total paralysis of right facial nerve. Offensive discharge from right ear. Posterior wall of meatus bulged forward, flabby, and covered carious bone. Some cholesteatomatous masses evacuated with probe.

Left ear showed a new formed *Mt*, with perforation through which a small polypus projected which was taken away. November 1, 1898, radical operation. After removing the external surface, the whole mastoid process presented itself transformed into a large cavity filled with an offensive, very large, cholesteatoma up to the lateral sinus and the dura mater. All the *cavities of the middle ear and the posterior cranial fossa were widely opened and thoroughly scraped*. A perforation of the medial aspect of the tip of the mastoid process led into a fistula which ran downward to the fistula on the neck. The tip was chiselled away and the

fistula scraped. The medial portion of the posterior wall of the meatus formed a loose sequester, which presented a semicanal, apparently the lateral portion of the Fallopian canal. The dura was largely exposed and thickened. No granulations ever developed on it; it practically exhibited the same smooth surface during the whole treatment as it shows now. The rest of the wound is covered with epidermis and scar tissue.

The patient recovered very well, and his hearing is better than before. The facial paralysis is partially cured, the patient can close his right eye completely, only the folds of the face on that side are not as deep as on the other. The right angle of mouth hangs lower than the other, and the patient is unable to whistle. The after-treatment, up to complete epidermization, lasted six months. When last seen, on December 7, 1899, everything had remained well.

The present condition is this: Postauricular external opening oval shaped, vertex downward, 2.75cm long, 1.5cm wide at the wider end. Wound covered with epidermis all over, excepting the dura mater. In the depth the dura mater is visible as a grayish membrane, and the sinus transversus, blue, shows distinct pulsations. The remainder of the petrous bone extends back to the frontal plane through the insertion of the concha. The greatest depth is 4cm. The posterior edge of the mastoid region projects over the cavity so that the inserted finger feels the dura about 2cm back of the overhanging wall.

The middle ear can be inspected from the posterior opening. It is perfectly dry and cicatrized and the attic very much enlarged, covered only in its posterior portion by skin of the meatus. The patient hears loud voice at two feet. The concha droops a little downward and forward, obstructing thereby the meatus, by bringing its posterior wall in contact with the anterior wall, which probably was caused by his crowding too much cotton into the postauricular opening. His hearing is improved when, by pulling the concha backward and upward, the meatus is made entirely free. The left ear shows perfect cicatrization of the tympanic cavity and attic, which is perfectly free. He hears loud voice at one foot but hears better with the other ear.

REPORT OF THE TRANSACTIONS OF THE NEW YORK OTOLOGICAL SOCIETY.

THOMAS J. HARRIS, M.D., SECRETARY.

MEETING OF JANUARY 28, 1908. THE PRESIDENT, DR.
SHEPPARD, OCCUPIED THE CHAIR.

Dr. PHILLIPS presented a case of **epithelioma of the ear** with the following history. A woman, age forty, consulted her family physician about seven months ago for pain in the ear and a watery discharge. The auditory canal was swollen and, together with the continued pain, led him in September to do a mastoid operation. October 1st, when Dr. Phillips saw the case, the posterior wound had closed but the ear stood out in an unusual manner; there was necrosis of the floor of the canal; the pain persisted and the discharge was foul-smelling. He did a radical operation, finding the antrum had not been opened. A second operation was speedily required to remove the growth of granulation tissue. There immediately developed a new growth on the posterior lip of the mastoid wound. The microscopic examination showed a flat-celled epithelioma. At present she was under the X-ray and the pain was less.

The induration of the anterior flap was recent. It was his opinion that the mastoid had never been involved until after opening by her family physician, and that the subsequent operations had been made necessary as a result of the unwarranted interference.

Dr. DENCH spoke of a case of **epithelioma** springing from the orifice of the external auditory canal. He excised the entire auricle, and removed the enlarged cervical glands. A permanent cure followed. He had seen several cases of

epithelioma of the external ear, and in every case cure had followed complete excision of the growth. He would advise a complete removal of the growth in Dr. Phillips's case, and the subsequent treatment either by the X-ray or radium, if prompt healing did not take place.

Dr. DENCH also reported a case of **fibro-sarcoma of the middle ear** completely cured by radical operation, and also a case of **small-cell sarcoma, involving the middle ear and mastoid**, in which a mastoid operation was done, with subsequent ligation of the common carotid. The external wound healed, in a most thorough manner, under X-ray treatment. The malignant disease, however, extended to the lateral pharyngeal wall, and the patient subsequently died.

Dr. HASKIN spoke of a case of **epithelioma of the ear** which he had reported two years ago. Here he had done a series of extensive operations to extirpate the growth without avail. There had been, however, no meningeal symptoms.

Dr. WILSON stated that the case of **epithelioma of ear** reported by him, treated by the X-ray and radium combined, had remained well now for four years.

Dr. BERENS reported a case of **endothelioma of the auditory canal**, which he had recently operated upon. It originated from the membranous canal. An extensive fistula was found in the upper wall of the bony canal. He advised total excision of the growth in Dr. Phillips's case, and then using the X-ray.

Dr. ALDERTON thought the time elapsing after the primary operation before recurrence a variable one, and three years was too short to pronounce positively for a cure.

Dr. BERENS referred to a case of very extensive **mastoiditis** which he had seen recently. There was a perforation in the zygoma and a fistula extending to the occiput, where there was a subperiosteal abscess beneath the attachment of the trapezius muscle.

Dr. DENCH said he had seen one case of **mastoiditis with occipital fistula**.

Dr. GRUENING referred to a case of **double mastoiditis with perforation of the zygoma**, which he had recently reported.

Dr. LEWIS showed an **aseptic aural irrigating outfit**.

Dr. DENCH referred to the question of diagnosis of **sinus thrombosis in children**, as suggested in two cases lately seen by him.

CASE 1.—The patient was a child about two years of age. About one week before Dr. Dench saw the patient there was a follicular tonsillitis accompanied by a characteristic temperature. The tonsillitis disappeared, and the patient was allowed to go out. Three days later the patient complained of pain in the right ear, and there was a sudden rise in temperature. A myringotomy was performed by the family physician. As no discharge followed, myringotomy was performed again on the second day. When Dr. Dench first saw the case, there was a temperature of 104° , and both drum membranes were bulging. Double myringotomy was done, followed by free discharge. Both smears, after incision, showed latent streptococcus infection. The temperature remained high for twenty-four hours after incision of the drum membrane, and then fell slightly; forty-eight hours after the incision, the temperature was about 105° . Sinus thrombosis was suspected, but on the following day the temperature came down gradually, and was practically normal all day. It rose in the evening to 106° , at which time a double mastoid operation was performed, with the exposure of both lateral sinuses. Both sinuses were normal. There was extensive infiltration of both mastoids. The temperature fell immediately after the mastoid operation, and did not rise after that above $101\frac{1}{2}^{\circ}$. The child died suddenly, with symptoms of meningitis, twenty-four hours after the mastoid operation. The first symptoms of meningitis were those referred to the circulation,—the heart being feeble, the extremities cold, and the pulse weak. A short time before this, both wounds were examined, and both lateral sinuses were found to be perfectly normal.

The second case was that of a child nineteen months of age who, a week before Dr. Dench saw the patient, seemed ill, did not take its food well, and was restless. The day before Dr. Dench saw her she was seen by the family physician. Negative report. When she was first seen by Dr. Dench the temperature was 105° . The child had been pulling at the ears as though in pain. Double otitis was present, and both

drum membranes were incised. Free discharge. The temperature fell considerably after the incision of the drum membranes, but 48 hours after, rose again to 104° . It then fell to nearly normal, but two days later rose to 106° . Both mastoids were opened and found to contain considerable pus and granulation tissue. Both lateral sinuses were exposed and seemed to be normal. The left sinus was larger than the right. The temperature after operation ranged between 101° and $102\frac{1}{2}^{\circ}$ for about a week, and then rose to $104\frac{1}{2}^{\circ}$. Examination of the blood, at intervals, was negative. Neither sinus was opened. Frequent examinations of the chest were made, with negative results. The temperature gradually fell to normal, and the child made a perfect recovery. In this case, Dr. Dench was inclined to think that there was some slight systemic infection through the lateral sinus, probably due to the small tributary vessels which run from the mastoid to the sinus, and that Nature provided sufficient antitoxin to overcome the general septic condition. He pointed out that in quite a number of cases where the jugular has been excised for septic thrombosis, although the clot in the vein may be perfectly sterile, the walls of the vein are infiltrated with pathogenic bacteria. He would be inclined to think, therefore, that in this instance septic infection had taken place through the walls of the sinus, but that by prompt operation on the mastoid and free exposure of the sinus further absorption had been prevented. In this case as both mastoids were equally involved, had no exploratory operation upon the sinus been performed, it would have been necessary to open both sinuses, a procedure which, undoubtedly, would have proved fatal, from the great disturbance of the cerebral circulation. He believed that the patient's life was saved simply by delaying further interference.

Discussion.

Dr. DUEL called attention to the fact that sharp rises of temperature, and vacillating temperatures, occurring in infants and young children, could not be regarded in the same light as when they occurred in adults. He referred to a number of temperature charts from cases at the Babies Hospital, all of which had vacillations in temperature, which, in

adults, would be regarded as an indication of septic sinus thrombosis, with a concomitant suppurative otitis or mastoiditis. However, these charts in many instances resulted from mild cases of grippe, in which there was no otitis and very slight physical signs elsewhere were present. His attention had been called to the cases owing to these slight physical signs, and the possibility of the rises in temperature having been caused by an otitis media. On the other hand, a number of cases with quite similar vacillations in temperature had been due to the development of an otitis media, and had recovered after myringotomy without further complications. Had similar temperatures developed in an adult with an otitis or mastoiditis accompanying grippe, he would have felt it necessary to uncover and explore the lateral sinus. It seemed to him that these apparently septic temperatures, developing without middle-ear complications in cases of grippe and gastro-enteritis, made it difficult to decide the question of exploration of the sinus in cases where such vacillations appeared when middle-ear suppuration was present as a complication. He felt that other indications of sepsis, like large increase in the polynuclear percentage or presence of bacteria in a culture from the blood, would be necessary in many instances to justify such explorations.

Dr. GRUENING said that there had been very few cases in the Pediatric wards at Mt. Sinai which had required operation, in his 27 years of service. In his experience children well taken care of did not need operation nearly as often as those that had been neglected.

Dr. DENCH thought a suppurating ear, with a septic temperature, if all other causes of temperature could be excluded, demanded an exposure of the sinus—possibly an exploration of this venous channel. Where the sinus is exposed, unless some definite evidence of thrombosis is present, Dr. Dench believed that the opening of the sinus might well be delayed for twelve hours. This was particularly true in cases of bilateral aural suppuration, in which the appearance of the sinus gave the operator no definite indication as to which sinus to open.

Dr. BERENS spoke of a child whose drum he had incised, where the irregular high temperature persisted and yet

only a mild bronchitis could be discovered by the clinician. Two days later a central pneumonia developed clearing the situation.

Dr. BACON reported the case of a lady seen in consultation on account of a temperature fluctuating from normal to 105°. This continued for 10 days and then cleared up.

There was no trouble with the ear and although the patient was seen by a number of physicians who examined the case carefully, the cause of the high temperature was never ascertained. This case shows the importance of not laying too much stress on high temperature, especially in children.

Dr. ALBERTON reported the history of a case of **double otitis media**, following scarlet fever, resulting in double mastoiditis and leading to operation; complicated by albuminuria and acute endocarditis.

The patient was a boy twelve years of age, and was admitted to the Kingston Avenue Hospital on October 21, 1907. Examination at the time of admission showed a marked erythema and fine punctate eruption of the skin; eyes and ears, negative; nose showed considerable obstruction; tongue was red and throat congested, with two yellowish patches; heart was rapid and sounds clear.

October 22d: The patient was much more comfortable. Pulse was regular, of good volume and moderate tension; heart sounds clear, first sound at apex rather snappy; hemorrhagic area about body and right arm.

October 23d: General condition was considerably improved; rash losing its intensity; pulse full and strong; heart sounds clear. Nasal passages were not so much obstructed, but showed profuse discharge.

October 24th: The patient complained of the right ear. The tympanic membrane was congested and there was moist serum in the canal. When the drum was incised, some sanguinolent secretion escaped, but no pus. The general condition was improving, but there was great difficulty in swallowing, though the throat was clear.

October 25th: Loud systolic murmurs at apex of heart, not transmitted; considerable muco-purulent discharge from the right ear; slight mastoid tenderness.

October 26th: Patient was cyanosed as to face and ex-

tremities; systolic murmur at apex, first sound prolonged, second sound snapping; right wrist and knee joints painful to touch.

October 27th: Patient swallowed better and breathed more easily. No cyanosis; heart sounds clear. There was a slight systolic murmur at apex, with first sound prolonged, and a loud systolic murmur at the right sternal margin, transmitted downward and upward. The right knee and wrist, both ankles, and the shoulders were tender, with considerable swelling about the right knee and wrist. The general condition was improved.

October 28th: The patient took nourishment better and swallowed more easily. Loud systolic murmurs were noted at the apex, not transmitted. The inflamed and swollen joints were subsiding; joints moved without pain. The ears discharged slightly; both mastoids were tender on pressure.

November 5th: Operation was done for double mastoiditis; great destruction of bone was found, with exposure of the sinuses, which apparently were not involved. Following the operation, there was slight paralysis of the right side of the face; other than this, the patient went on to good recovery, and is practically well to-day, the paralysis of the face having disappeared. The main point in regard to this patient was the fact that the indications of probable sinus involvement were present preceding operation. He had a chill and the temperature shot up to 106° ; following the operation the temperature rose as high as 105° , and yet, because of the condition of the patient, it was not thought advisable to investigate the sinuses. He made ultimately a good recovery.

Dr. ALBERTON said that occasionally malaria was the cause of the temperature in these obscure cases. He had seen such a case recently where quinine had stopped the fever and the patient completely recovered.

Dr. HASKIN called attention to the frequency in which intestinal infection was found in children suffering from ear trouble.

Dr. BACON reported a case of acute otitis media in a child where the temperature was due to pyelitis. The patient was an infant, female, six months of age, who had a gripe infection.

The drumheads were incised. An examination of the urine showed the presence of considerable pus. The patient made a good recovery. We often see cases of grippe in children commencing with an acute otitis media. After incising the drumheads the temperature frequently remains high and such children often have a bronchitis. The temperature frequently is due to a central pneumonia, the symptoms of which may not be evident for 3 or 4 days.

MEETING OF MARCH 24, 1908. THE PRESIDENT, DOCTOR
JOHN E. SHEPPARD, PRESIDED.

Dr. BRYANT presented a case of **chronic middle ear suppuration**, mastoiditis, sinus and jugular thrombosis, gangrene of dura mater, basilar meningitis, pneumothorax, double pyothorax, radical mastoid operation, extensive exposure of dura over cerebellum, excision of jugular vein, section of sigmoid and lateral sinus, excision of rib. Temperature ranging between 105-106° and frequent chills for 8 weeks. Treated by operation and local antiseptics in an open out-of-door ward. Recovery. Hearing in operated ear, watch 6 inches, $\frac{6}{36}$

Dr. GRUENING reported the history of a **fatal case** of **mastoiditis** complicated by **thrombosis** of all the **sinuses** of the **head**. A boy was recently admitted to the hospital with symptoms of mastoid disease including a temperature of 106. There was a history of measles some time previous. For two weeks there had been an acute exacerbation of a chronic inflammation of the left ear, which had stopped at the time of admission. The pain which had ceased had recurred in the ear and there had been a chill. The neck was held very rigid and there was exquisite tenderness behind the sterno cleido-mastoid. There was a leucocytosis of 15,000 and a polynuclear count of 90%. The operation which was immediately performed showed a mastoid entirely destroyed, with exposure of the sinus which on being opened was found to contain pus. The vein was tied and excised and a return flow of blood established at the distal end of the sinus at a distance of about 1 inch from the torcular. The blood culture showed the presence of protens. There was a normal temperature at any time. There then developed an ecchymosis

of one eyelid soon followed by that of the other. The head became greatly swollen and disfigured. On the fifth day he became unconscious and died on the tenth day after the operation. The autopsy revealed a thrombosis of all the sinuses of the head, together with metastatic abscesses in the lungs. There was no optic neuritis which seemed to show in Dr. Gruening's opinion that optic neuritis was not due to the thrombosis of the sinuses alone but probably to thrombosis plus intracranial pressure.

Discussion.—Dr. KIPP said that for many years he had thought that optic neuritis was never found in an uncomplicated case of sinus thrombosis but recently he had seen several cases where such a condition was present and he now believed that this was to be explained by the unrecognized existence of a serous meningitis or oedema of the brain tissue.

Dr. McKERNON reported a case of **Stacke operation** where the operation showed an almost complete bony obliteration of the tympanic cavity. The patient was a man of forty-one who had suffered from a suppuration from the middle ear for twenty-eight years and who had had over twenty aural operations through the external auditory canal. Examination showed that the lumen of the canal was occluded by a bony growth, above and anterior to which was considerable foul-smelling secretion. He complained of constant vertigo. There was no fever, and blood examination gave 16,000 leucocytosis and 62% polynuclear count. A radical operation was performed after forty-eight hours of observation. The cortex was found to be normal. The lateral sinus was, however, displaced very far forward and no antrum could be found. The middle ear was filled with a bony growth, there being in front only a cavity sufficient to admit the end of an applicator. The facial nerve lay exposed in the mass at least a quarter of an inch anterior to its usual position. A probe passed through the tegmen tympani to the dura evacuating an epidural collection of pus. This space was walled off by adhesions. The patient made a good recovery.

Discussion.—Dr. DENCH had seen this condition of bony growth in the middle ear in several cases but only in the beginning stage.

Dr. DENCH referred to the question of the **wisdom of**

removing granulation tissue in ambulatory patients and reported the case of a patient recently seen whom he had admitted to the hospital and had then removed the granulation tissue. The temperature which had previously been normal, at once went up to 104°. It later descended to normal but the patient had a chill and high temperature again. The radical operation which was then done revealed a clot in the sinus and in the vein. The vein was excised. There was a good recovery. This confirmed in his opinion his former statement that we were not justified in removing granulation tissue and then allowing our patient to go home. Indeed in most cases, a radical operation, was usually demanded where granulation tissue is present.

Discussion.—Dr. GRUENING did not agree with Dr. Dench and thought that in many cases local treatment if sufficiently long continued will cure the disease.

Dr. BACON said that it was often necessary to remove granulation in order to decide upon the advisability of a radical operation. He however agreed as to the wisdom of hospital supervision for such cases.

Dr. KIPP felt that Dr. Dench's position about hospital confinement in these cases was the proper course.

Dr. McKERNON said that a number of years ago he had had a fatal case of meningitis following the removal of granulation tissue and was inclined to believe that the safest course was to open the ear from behind.

Dr. HARRIS reported a fatal case of **acute mastoiditis complicated by sinus thrombosis and meningitis**. The patient was a boy of ten who had just recovered from an attack of measles. When he first saw the case there had been a profuse suppuration from the affected ear for three days. There was no fever, no pain in the ear nor in the head. Examination showed no sagging of the superior wall, and no bulging of the drum. Deep pressure over the mastoid elicited no tenderness. The boy was at once ordered into the hospital. A smear from the ear pus showed pneumococci. There was a leucocytosis of 11,000 and a polynuclear count of 83%. In the absence of all mastoid symptoms it was determined to pursue an expectant course of treatment. Under hot irrigation and a wick carried down to the drum

the lad appeared to improve. He slept well at night and appeared bright in every way. There was, however, no cessation in the discharge and a blood examination on the fifth day after admission showed a leucocytosis of 16,000 and polynuclear of 87%. Dr. Harris accordingly determined to operate chiefly for the purpose of cutting the suppuration short. The mastoid was found very little diseased. There was considerable granulation in the antrum and the upper wall was quite soft. There was a small amount of pus in the antrum and in the tip cells. The operation lasted forty minutes. The only unusual fact to be noted was that the sinus was situated far forward and was exposed but not opened during the operation as it looked entirely normal. There was persistent vomiting following the operation but nothing else abnormal. The temperature, however, at once rose and twenty-four hours after the operation was 104 by rectum. The dressings were taken down and the wound found perfectly clean except at the tip where a drop of pus was seen beside the muscle suggesting the probability of a burrowing abscess in that locality. The fever did not go down but fluctuated from 102 to 104. There was no headache, no eye symptoms, and only a tenderness on touching the parts below the mastoid. There was obstinate constipation which was thought to account for some of the fever. On the fifth day after the operation, occipital headache and stiffness of the neck were noted. A lumbar puncture was made and showed a cloudy fluid with many leucocytes. A pure culture gave streptococci. An exploratory opening of the sinus revealed a firm, apparently healthy clot extending from the knee down into the bulb. A free flow was established from the torcular end but an unsatisfactory flow from the bulb. On account of the weakness of the patient and the evident presence of a meningitis it was determined not to tie the jugular vein at that time. The general sepsis was not checked by the operation. In the following day an incision was made into the brain but no excess of pressure on the membranes discovered. Death took place the same night. He remained conscious to the last. The case was very puzzling because of the absence of all mastoid symptoms as well as of any symptoms pointing to a beginning meningitis. It would be interesting to

know if the meningitis was direct from the ear or took place through the sinus. It is also of interest to know the way that the primary operation served to light up what had probably been a latent process.

Discussion.—Dr. PHILLIPS said that this case was particularly instructive to him, because it showed how an extensive meningitis could exist without any of the usual symptoms which are wont to be found in the disease.

Dr. BACON said that he recalled several cases of high temperature in children with sinus thrombosis. The classical up and down curve was entirely lacking.

Dr. DENCH reported a case of **plastic operation** to establish a normal canal after bony occlusion following an automobile accident. A fracture of the canal was discovered. There had been no discharge but loss of hearing. The operation restored the hearing to practically normal.

Dr. LEWIS reported two cases of **primary mastoiditis**. The first case was in a woman, æt. 45 with a neurotic history, who complained of a very slight pain in the ear and of a very moderate tenderness on deep pressure over the mastoid. This had continued for ten days previous to his seeing her. Examination showed but slight injection of the manubrial vessels, no bulging of the membrani tympani, and hearing but little diminished. He suggested a paracentesis of the membrana tympani which was done, and was followed by a slight serous exudate which ceased with the healing of the membrana tympani within twenty-four hours. Four or five days later tenderness over the mastoid process increased and the tissues were œdematous. He operated upon the case the next day, a cortical perforation was found, with considerable involvement of the cells.

The second case was seen at the Vanderbilt Clinic, the mastoid was extremely tender, the soft parts covering it œdematous with fluctuating at one point. There was no history of any discharge from the ear and the membrana tympani was normal in appearance. A cortical perforation was found when the mastoid process was opened and the cells were markedly involved.

Both were evidently cases of primary mastoiditis.

REPORT OF THE TRANSACTIONS OF THE CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY.

MEETING OF FEBRUARY 11, 1908. DR. A. H. ANDREWS,
PRESIDENT.

Dr. WILSON read a paper on some points in the anatomy of the frontal sinus, which dealt chiefly with discussion of the floor of the frontal sinus, its relation to the nasal cavities, and the cribriform plate.

Dr. GOOD described an intranasal method for opening the frontal sinus. Dr. Good, after cocainizing the sinus by injecting 10% cocain, introduced into the sinus through the naso-frontal duct a small curved protector with the concavity anterior, then with a long narrow chisel part of the process frontalis of the superior maxillary bone, and a part of the spina frontalis of the frontal bone and the anterior median wall of the ethmoid labyrinth are chiselled through and removed with forceps and curettes. An instrument in the form of a rasp is introduced, and by directing the force of the rasp inwards and forwards a larger opening into the frontal sinus is obtained.

Dr. BECK has seen localized meningitis follow an intranasal operation done according to the Halle method. He calls attention to the inadequacy of intranasal operations when the sinus is divided by bony partitions. He thinks Dr. Wilson's method of locating the cribriform plate will be found of great value. He has attempted the same by means of the X-ray, but considers Dr. Wilson's measurements superior.

Dr. CORWIN is pleased with Dr. Good's demonstration, but

when the cavities and passages are filled with mucous membrane the use of the instruments will be more difficult, and adhesions which will interfere with perfect drainage will be likely to follow.

Dr. BALLENGER has found that in about one-half the cases the naso-frontal duct drains into the infundibulum and about one-half into the middle meatus as pointed out by Dr. Wilson. Accidents occurring during external operations are as frequent as those occurring in intranasal operations, the percentage in the former being greater when the radical operation is undertaken. He is impressed with Dr. Good's method and intends to try the operation. Serious results are not to be expected from removal of or injury to the inner table provided the dura is not opened. There is always more or less danger of hemorrhage from the anterior ethmoidal artery. Drainage is not the only consideration in these cases. If the cavity is thoroughly ventilated the infection will usually disappear even though the drainage is not perfect.

Dr. SHAMBAUGH thinks that in nearly all cases of acute disease of the frontal sinus intranasal operation will be found sufficient and in the chronic cases the external method should be employed only after the intranasal operation has failed. In many of the cases it is sufficient to remove the anterior end of the middle turbinate and the anterior ethmoid cells. This procedure frequently leaves the patient in better condition than the more radical intranasal operations. The rasp as shown by Dr. Good appeals to him as a good instrument for enlarging the opening into the sinus but when the opening is sufficiently large to admit the rasp drainage should be sufficient without having to use it. He exhibited a specimen in which the cribriform plate extended one-half inch anterior to the naso-frontal duct. In such cases a radical intranasal operation especially the use of a chisel would be likely to injure this structure. While the mere exposure of the dura in most localities is not associated with any great risk any injury to the cribriform plate is a much more serious matter. This plate is perforated by numerous nerve filaments and lymphatics which bring the dura into close relation with the nasal cavity. A mere fracture of the cribriform plate, even without a perforating wound, must result in considerable

laceration of these prolongations, and open the way for intracranial infection. Of the numerous intranasal methods for enlarging the opening of the frontal sinus he considers the method devised by Dr. Ingals as the safest yet suggested.

Dr. HOLINGER thinks it is not sufficient to provide for the escape of pus from the intranasal accessory cavities, but that they should be frequently cleansed by boric acid solution until the symptoms have disappeared. It must be remembered that the bony walls of these cavities are frequently diseased and that in operating the cranial cavity may be invaded even when only a probe is used. In the cases requiring operation there is more likely to be an abnormal arrangement of the opening than in normal skulls. The use of the rasp and curette is likely to be followed by the formation of granulation tissue which later will obstruct the drainage, while the cutting forceps does less violence to the tissues that remain.

Dr. ANDREWS sees some points in Dr. Good's method which are of value. He thinks greater accuracy is needed in the use of the terms "hiatus" and "infundibulum," and heartily commends the nomenclature as brought to the attention of the society by Dr. Wilson.

Dr. Wilson's determination of the location of the cribriform plate of the ethmoid is a most valuable contribution. He has never seen it described in the literature and thinks Dr. Wilson should be given full credit for establishing this rule.

Dr. WILSON (closing) has not been able to find any reference in the literature to locating the cribriform plate in relation to a line drawn from the nasal spine to the occipital protuberance. He favors draining the frontal sinus by the intranasal route, but thinks that before an operation is undertaken the relation of the naso-frontal duct to the cribriform plate should be ascertained. Exposing the dura seems to be harmless, but perforating the dura is dangerous, because the lymphatics lie not external to it, but in the arachnoid space, and this is continued down over the olfactory nerves as they pass into the nasal cavities.

Dr. GOOD (closing) does not consider exposing the dura as dangerous, but if it is perforated meningitis will be very

likely to result. The cribriform plate is not in the field of his operation, as he keeps external to it, passing upward at a tangent to the orbital wall. He does not recommend his operation for cases that can be cured by more conservative measures.

REPORT OF THE TRANSACTIONS OF THE SECTION ON OTOTOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

MEETING OF FEBRUARY 14, 1908. A. B. DUEL, M.D., CHAIRMAN.

Presentation of Instruments.

A NEW ELECTRIC MOTOR FOR CRANIAL SURGERY. By Wm. Sohler Bryant, M.D.

ELECTRIC LIGHT BULB. Presented by Dr. W. H. Haskin. Discussed by Drs. Wilson and Smyth.

Presentation of Patients.

CASE OF CARCINOMA SPRINGING FROM THE EXTERNAL CANAL. Presented by Emil Gruening, M.D. Discussion: Drs. Quinlan, Bryant, Johnson.

FOUR CASES OF OSSICULECTOMY. Presented by Dr. W. H. Haskin. Discussion: Drs. Gruening, Wilson, Bryant, Johnson, Kerrison, Duel, Haskin.

CASE OF OBJECTIVE TINNITUS DUE TO CONVULSIVE TIC OF THE TENSOR AND LEVATOR PALATI. Presented by Dr. G. B. McAuliffe. Discussion: Drs. Hinkle, Smyth, Quinlan, Bryant, Coburn, Cox.

Reports of Cases.

CASE OF MENINGITIS OF OTITIC ORIGIN. Operation; recovery. Dr. P. D. Kerrison. Discussion: Drs. Gruening, Quinlan, Kerrison.

CASE OF CEREBRAL ABSCESS WITH APHASIA. Dr. B. F. Knause. Discussion: Dr. Dougherty.

CASE OF MASTOIDITIS WITH INTERESTING FEATURES. Dr. A. B. Wiener.

Dr. Herman Knapp presented copies of the ARCHIVES OF OTOTOLOGY in both German and English.

A new electric motor for cranial surgery. Wm. Sohler Bryant, M.D.

Dr. W. SOHLER BRYANT presented this new instrument,

ILLUSTRATING DR. BRYANT'S ARTICLE ON "A NEW ELECTRIC MOTOR FOR
CRANIAL SURGERY." (See page 102.)



A new electric motor for cranial surgery. Motor as held in the hand
ready to operate.

the first application of electric power in a form combining great energy with small size and weight. The motor is unique inasmuch as it is the first practical adaptation of well-known electrical principles, a fact which enables it to combine three tenths horse-power with a weight of only seven pounds. It is about one eighth the size and weight of the ordinary motor of equal power and its speed of 15,000 revolutions per minute is far in excess of that of any motors on the market. The light weight of the motor fills the requirements better than any other for use in a flying machine, where weight is the chief difficulty to be overcome. This tool is the only electric-driven machine of high speed and power that can be held in the hand. It has solved the problem of shifting or gearing by doing away with both, for, since it can be readily held in the hand, gearing or flexible shifting is thus unnecessary. On account of the great speed of the motor a phase with only one cutting edge, which cannot clog, can be used. The phase does not heat; the chips take up whatever heat is generated. An important surgical point is that the motor, together with its wire connection, is sterilizable. Owing to the speed and power of the motor, the instrument is very effective, since it eats up the bone very rapidly. It can be used as a drill, as a burr to enlarge a bone cavity, as a phase to cut an osteoplastic flap, and as a trephine. The phase will not cut soft tissue. On account of the rapidity with which it works much valuable time is saved.

Description of motor. $\frac{3}{10}$ horse power. 3 phase. 10 volts. 15,000 revolutions per minute. 185 cycles. 2 poles. Weight, 7 lbs., 5 ozs. Diameter, $2\frac{1}{8}$ inches. Length of barrel, $9\frac{1}{2}$ inches.

The motor was designed and constructed for Dr. Bryant by the International Instrument Co. of Cambridge, Mass.

New Electric Light Bulb (Tantalum light). Presented by W. H. HASKIN, M.D.

Dr. HASKIN showed this bulb, which had recently been brought to his attention. It was a particularly useful light for nose and throat men, inasmuch as there was no reflection from the wires in the headlight, such as one gets from the ordinary light. There are a great many wires in the bulb. The one showed was a 32-candle power. The agent had also

showed him an 80-candle lamp, which gave a remarkably powerful light. Dr. HASKIN said that he had been told that a 32-power lamp would use less than half the electricity consumed by the ordinary lamp.

Dr. WILSON said that the question of light was a most important one. All of the lights used are too rich in actinic rays. He had been partially blind for three weeks last October from the effect of a 50-candle power electric light. All of these lamps are made with the idea of giving a white light, and are too rich in the actinic rays. At present he was making some experiments with amber glass to cut out the actinic ray, and get a light that will not injure the eye.

Dr. H. E. SMYTH said that he had recently received two of these lamps for trial from the Bridgeport Electric Light Company. The claim made for them was that, although 25-candle power they required but 50 watts, 55 watts being necessary for the old 16-candle power lamp. The difference in the amount of electricity used was said to more than make up for the additional cost of the lamp.

Presentation of Cases.

Case of carcinoma springing from the external canal. EMIL GRUENING, M.D.

The patient did not present himself, but Dr. Gruening gave the history of the case:

The patient, a man of 65 years, said that ten months before he came to the hospital the ear began to discharge. There was something that blocked the canal of the ear and bled frequently. It itched and he scratched it. There was very little pain.

On examination the external meatus was found to be filled with a red lobulated mass. A probe could be swept over it but not under it, showing that there was a broad base. Dr. Gruening said that he had seen polypi springing from the middle ear, which grew and protruded, but this had a different appearance. Here was a red irregular mass. The patient was very sensitive and would not allow a piece to be removed for examination, but was perfectly willing to be

anæsthetized and have the entire mass removed, which was done. The mass was the size of a large strawberry, was attached to the lower wall of the canal, and extended from the meatus to the beginning of the osseous canal, so that the whole membranous canal (the lower wall) formed its base. The middle ear was not affected. The patient refused to have anything further done, although Dr. Gruening thought that it was possible to cut out the base.

The pathologist of the Mt. Sinai Hospital, Dr. MANDLEBAUM, reported that the mass was a squamous-celled carcinoma. Carcinoma of the external ear does not seem to be frequent. In looking up the literature of the subject he found a general description of carcinoma in the external canal by Politzer which tallies exactly with the present case, showing that he must have been familiar with such cases inasmuch as he portrayed the condition so accurately.

In reply to a query from Dr. QUINLAN, Dr. GRUENING said that the glands were not involved. He had waited for the microscopic report, but had not seen the patient since. He had hoped that the man would come to-night.

Dr. QUINLAN said that he had seen two similar cases in the external auditory canal, springing from the anterior and inferior wall. Both cases refused operative interference, and in due time died of general metastases. In both cases the microscope revealed epithelioma of a progressive type.

Dr. BRYANT said that he could recall four cases that he had seen during his service at the Mass. Charitable Eye and Ear Infirmary similar to the case reported by Dr. Gruening. These cases were characterized by middle ear polypi, which were exquisitely tender. He had never seen one with polypi of the canal alone. He did not know the subsequent course of these cases. Lately he had seen two cases of rodent epithelioma of the auricle located at the edge of the meatus in old men. Both cases yielded quickly to the X-ray. Three exposures were sufficient to cause cicatrization in one case. Dr. Morton treated this case. Within the past two years Dr. Bryant had seen three cases of malignant growth of the ear—one an endothelioma of the middle ear, and death by mediastinal metastases. This case has been reported at length in "A Case of Carcinoma of the Middle Ear, probably

Endothelioma," *Annals of Otology, Rhinology, and Laryngology*, June, 1907, Vol. xvi., No. 2, p. 301. The other two cases were diffuse carcinoma of the ear and neighboring tissue, resulting in death. All the cases seen had had a continued chronic middle ear suppuration antedating the malignant growth. Dr. Bryant thought that this was an important etiological fact.

Dr. JOHNSON said that there was much difference between the epitheliomatous and carcinomatous cases. Many epitheliomatous cases yield to the X-ray and other cases of this class are excited by it. He had seen two cases similar to that described by Dr. Gruening—carcinoma of the auditory canal. One ultimately involved the bone behind the ear, and this patient died with great destruction of bone, and finally infection of the cerebral cavity: in the other case, the infection passed down the neck and the patient died from metastasis. One case was operated upon, the other not. The operation did no good, neither did the treatment by the X-ray, nor the erysipelas toxin as used by Coley. In carcinomatous cases where the bone is involved the prognosis is very grave.

Four cases of ossiculectomy. W. H. HASKIN, M.D.

These four cases of chronic suppurative otitis media were operated upon under local anæsthesia—hypodermics of 1 per cent solution of cocaine and 1-1000 adrenalin. No promise of improvement in hearing was made to any of them, but they all claim to hear decidedly better than before the operation, and the tests seem to confirm this. Only one of the patients complained of suffering during the operation, and he was a man.

CASE I.—Woman of 54. For the past few years she has had a discharge from the left ear. No pain. Two weeks ago she had grippe, and following this buzzing in the ears. In the left ear the internal portion of the internal auditory canal was filled with granuloma. The ear was curetted and later an ossiculectomy was done under cocaine anæsthesia. The ear has been dry ever since, and she now hears a watch at four inches and a low voice at ten feet. One of the members had said recently that whenever he saw an ear such as this patient had he advised operation without hesitation.

CASE II.—This patient had a history of right ear discharge for two years, but does not know the cause. Has always suffered more or less from earaches. Had measles when a child. When she applied to Dr. Haskin for treatment she had been under the care of the men in the nose and throat department, and had been very severely cauterized with chromic acid, so that it required a month of treatment to get her into condition for the operation. There was complete destruction of the drum membrane, with hearing of the watch on contact only. Ossiculectomy was done November 20, 1907, and the ear has been dry ever since. The malleus and the incus were taken out. She is now able to pursue her work as a stenographer.

CASE III.—This patient, a Canadian, 48 years old, had disease of the ear following scarlet-fever when two years old, accompanied with discharge from both ears, pain, and deafness. The discharge had increased up to the time of operation. In both ears there was a large destruction of the drum membrane, and in the left ear there was a calcareous band across the lower portion of the remains. A large amount of inspissated discharge was removed from both attics, which gave her great relief. On pressing the stapes it was found that she had decided dizziness. No improvement in hearing was promised, but a double ossiculectomy was performed under cocaine, and the discharge has ceased. The patient is very happy about her hearing, goes to church and hears the minister very well.

CASE IV.—Patient, 22 years of age, had an attack of measles when 4 years old and has had pain in both ears ever since. On examination was found to have O. M. P. C. in both ears, with large granulomata in the left ear. The granulomata were removed under cocaine and ossiculectomy was done. The man complained greatly of pain, but that may have been explained by the fact that he had a chronic mastoid and there was some difficulty in anæsthetizing the canal, so that he did not have as complete anæsthesia as the other patients. The ear has been practically dry ever since the operation, there is no pain, and he insists that his hearing has greatly improved. The right ear is full of pus and has to be treated all the time.

One has to be very careful in giving the anæsthesia in these cases. One of the men in the clinic attempted to do an ossiculectomy under cocaine, and obtained very good results so far as the discharge was concerned, but unfortunately the patient had an infection through the anterior wall and has had a very serious time. The infection ran down the jaw, and the patient went to the throat department and was taken care of by one of the surgeons there. It is probable that the needle was inserted too deeply, and set up an infection through the anterior wall.

Discussion.—Dr. GRUENING inquired whether the patients had been previously treated for the cure of the discharge, and also whether the ossicles were actually carious when removed,—for that would show that the antrum was not diseased or that there was no deeper disease,—if the removal of the granuloma answers for the cure of the disease.

Dr. WILSON asked Dr. Haskin to be a little more specific about the manner of administering the anæsthetic.

Dr. BRYANT said that in all but an extremely small number of cases of middle-ear suppuration he could get a satisfactory result without any operation whatever. That when it came to a question of operation he did not think ossiculectomy was the operation of election any more than the “radical” operation. His impression was that there had been some fatal results from both these operations in unskilful hands. He thought it worth while to save tympanic bones for future usefulness. All things considered he elected his mastoideo-tympanotomy in preference to the other operation, in spite of its being a somewhat longer operation than ossiculectomy, because it would not lead into serious danger or destroy the hearing. In fact in mastoideo-tympanotomy with the ossicles in place the hearing is restored to normal. He said the hearing results from his radicals had been better than from his ossiculectomies, but he thought that in the experience of most operators the reverse was the case.

Dr. JOHNSON wished to know whether or not these were selected cases. He had carefully inquired of each whether or not the hearing was better than it was previous to the operation, and each replied in the affirmative, and stated that the hearing was decidedly better. In many cases where

ossiculectomy is done the hearing has been interfered with rather than improved, and he would like to know whether these cases were selected because the hearing was improved or taken at random.

Dr. KERRISON inquired whether there were any indications for this operation rather than others, or whether Dr. Haskin recommends it for all cases of suppurative otitis. He would like to know the indications for this operation in preference to the radical one.

Dr. DUEL said that it seemed to him that the operation of ossiculectomy for the relief of suppurative conditions has a limited field. There are a number of cases which can be cured by the removal of the malleus and incus to afford better drainage, but there are many others in which it is insufficient, owing to the fact that the operative field was not large enough to allow a thorough examination of the middle ear and its surroundings. For instance, where there is a mass of cholesteatomatous material, or in a tuberculous patient, or in another in whom there is a necessity for immediate interference, resulting from symptoms like high temperature, dizziness, or hemicrania. If these conditions were eliminated, a large number would be removed in which ossiculectomy would be indicated. The question as to whether the hearing would be benefited or not was of course a doubtful point. To his mind, this depended more on the amount of destruction which had taken place about the internal wall of the tympanum than upon the preservation of the ossicles.

Dr. HASKIN, replying to Dr. Wilson's query in regard to the method of anæsthetization, said that he first thoroughly sterilizes the field of operation, then with ethyl-chloride freezes the portion behind the ear; then drawing the canal-wall forward the needle is inserted between the periosteum and the bony portion of the lower wall, the solution being slowly forced in as the needle advances. Then two other injections are made, one in the posterior wall and the other in the upper canal wall. After ten minutes the field becomes white, and anæsthetized, and the patient suffers ordinarily no distress. The operation usually lasts for about ten minutes.

The question of selecting the cases is a very large one.

Not every case, of course, is suitable for ossiculectomy. All should be treated carefully, with intra-tympanic syringing, etc., but when there is distinct caries of the ossicles, or they are bound down by adhesions the bones are certainly much better out of the middle ear than in it. Under such conditions they do not tend to conserve the hearing. There are many cases where the patient comes in with a mass of thick dried inspissated secretion packed up behind the chain of diseased ossicles, and gives a history of occasional attacks of very offensive otorrhœa. If in such cases the ossicles are removed, the patients will be relieved and generally the hearing will be improved. The discharge does not usually annoy the patients until it becomes extremely offensive. The question of hearing is one where one must be very guarded, but where you get distinct motion in the stapes and distinct dizziness on pressure on the stapes,—one evidence that the stapes is not bound down by a bony union in the foramen ovale—the patients will probably hear much better. All of the cases presented this evening claim to hear much better. The actual test does not show much improvement, but they say they can now hear conversation, clocks, and things which they have not heard for years. The practical results are certainly very satisfactory. Of course in cases of large cholesteatomatous masses, ossiculectomy is out of the question, and in many others where there is a profuse discharge coming for instance from the attic and not from the ossicular chain. These cases are not suitable for ossiculectomy and would not be helped by it. They might be helped by syringing of the antrum or attic, but not by ossiculectomy. In these old chronic cases, with slight occasional offensive discharge and decided diminution in hearing due to impaction of the dried secretions, however, he believed that a great majority of them could be helped by this operation.

In reply to Dr. Johnson's inquiry as to whether these were specially selected cases, Dr. Haskin replied in the negative. He had a small bottle filled with ossicles removed in the last few years, and in most of the cases the patients claimed to have much improved hearing, and their otorrhœa had ceased.

Case of objective tinnitus due to convulsive tic of the tensor and levator palati. G. B. McAULIFFE, M.D.

Dr. McAULIFFE said that a year and a half ago this patient had an attack of O. M. C. A. No paracentesis was done and the attack subsided, leaving, however, in the left ear a buzzing and scratching tinnitus. The patient claims to have been under constant treatment—inflation, etc.—for a year, and had then a discharge which lasted for two weeks. He has been to various clinics and had various suggestions offered for his relief, but with no benefit. He had his tonsils removed last October, but after that the crackling became constant on both sides. He then submitted to a submucous operation, and has had other treatment for his nose and throat, but no relief to the tinnitus.

Examination reveals a ringing in the left ear, and in the right. When the case was first seen Dr. McAuliffe was non-plussed as to its etiology. The tinnitus was quite audible. On examination of the throat, however, he found there symptoms of convulsive tic. Thinking that perhaps the noise was influenced by spasm of the tensor-tympani, the ear was filled with oil to see if that would change the character of the noise, but it had no effect. On depressing the tongue and getting the palatal muscle in fixation, the noise disappears. The patient was then instructed to use things in his mouth to depress the tongue. If he holds his breath the noise disappears, but night and day he is troubled with this tinnitus, which is becoming a mental condition. Electricity increases the tinnitus. In all probability the trouble is caused by the contraction of the tensor and levator palati. This tic is pretty constant. The patient has had internal treatment of salicylates, arsenic, etc., but without any relief. The question is what can be done to relieve this condition of convulsive tic.

On inquiring into the subject, Dr. McAuliffe found that a number of men had seen similar cases, one patient being known as the human Waterbury watch. Dr. Hinkel had had this case. One man put the patient down for a diverticulum of the œsophagus. He was cured eventually by suggestive treatment—hypnosis. Dr. McAuliffe did not believe that medical treatment would do this patient any good. He had acquired the cocaine habit, and has practically refused inflation on account of the long courses he has had in

ordinary aural therapeutics. He had been examined in regard to his eye conditions, but the report has not yet been received. He is perfectly healthy physically, except for the neurotic element, which is strong. He has absolutely no apparent abnormality.

Dr. SMYTH told of a prominent business man of 50 years of age who had a similar objective tinnitus. The noise was much louder than in the case under discussion, being heard easily a foot or more away. It was due to a contraction of the palatine muscles, and could be controlled by the patient, who was a decided neurasthenic. The Doctor said that he knew nothing of the subsequent history of the case.

Dr. HINKLE said that she had no remarks to make upon the present case, but that the patient referred to by Dr. McAuliffe had been under her care, and the point of similarity between the two was the presence of a ticking sound clearly audible a short distance from the patient. This sound was of a rhythmical character, of about the loudness of a watch, and the patient was nick-named in one of the hospitals "the human Waterbury watch." There was no disturbance of hearing and no vibration of the tongue and palate as in this case, but the condition was that of a spasmodic stricture of the œsophagus, and the muscles of the throat, alternately relaxing and contracting, were plainly visible.

Dr. QUINLAN said that some years ago he saw a case which went almost to the point of mania on account of the objective as well as the subjective conditions. He anæsthetized the patient and put his finger in the soft palate and stretched it as one does a sphincter, and dilated it so that several days after the patient felt the trauma. This treatment seemed to have a good effect on both the mental and physical condition of the patient. He was under observation for eight or nine months, and there was no return of this spasm. Dr. Quinlan said that he thought this tenesmus in the palatal region can sometimes be treated suggestively under certain conditions. This case was the only one of an exaggerated type he had ever seen. He followed it for six months and the man was absolutely free from the subjective noise as well as the spasmodic click.

Dr. BRYANT said that Dr. McAuliffe had shown a very

interesting case of objective pharyngeal tinnitus due to a convulsive tic of the palatine muscles. The cases of objective pharyngeal tinnitus that he had seen differed from this case inasmuch as in his cases the tinnitus was irregular and occasionally stopped. It was evidently under the control of the subconsciousness, because the tinnitus stopped if the attention of the patient was strongly diverted.

Dr. COBURN said that a year or so ago he had presented before the Laryngological Section a case of rhythmical contraction of the soft palate with some of the pharyngeal muscles, but this case had no tinnitus aurium. It was evidently due to a bulbar lesion, for the patient had evidences of general cerebral disease. He asked whether Dr. McAuliffe's case showed contraction of the eustachian tube by post-rhinoscopic examination.

Dr. COX told of a case he had seen recently of a different type—that of pulsating tinnitus. The sound was objective, in that it could be heard by the observer, through the auscultation tube. The patient had been an athlete, and some months before he had been wrestling and sustained a fall or a strain about the neck, and this tinnitus had been constant ever since, except when it was stopped by pressure on the carotid artery, or throwing his chin about so as to check it. On using an auscultation tube the roaring sound could be distinctly heard, but could be stopped by pressure on the carotid artery. An examination was made for aneurism, but none could be detected. The only lesion that could be discovered was some slight aortic obstruction; but there was no aneurismal bruit anywhere.

Case of meningitis of otitic origin. Operation. Recovery.
Dr. P. D. KERRISON.

Dr. GRUENING inquired how often the dressing was changed, and what dressing was employed.

Dr. QUINLAN inquired whether the fluid removed from the dura had been examined. He then told of a case of cerebro-spinal meningitis with middle ear symptoms that occurred at St. Vincent's Hospital. The boy was in such a condition that operative measures were absolutely forbidden, and it was decided to try the Flexner fluid. This was given through the spinal canal, and the patient made an excellent

recovery, although he had been in extremis when the treatment was applied. The day the fluid was injected his temperature was 104.5°. Whether it was the subsidence of the disease or the neutralization of the infection material, his pulse and temperature glided into the zone of health and remained there until he left the hospital.

Replying to Dr. Quinlan's question, Dr. Kerrison replied that the fluid from the dura was not examined.

The dressing employed was simple sterile gauze applied against the dural surface, which had three parallel incisions. The first day the dressing was changed twice, also on the second day, after that once a day. They were usually very much soaked through.

Case of cerebral abscess with aphasia. Dr. B. F. KNAUSE.

Dr. DOUGHERTY said that Dr. Knause had given a very thorough report of the patient. He himself had seen the patient on July 5th. The patient had entered the erysipelas ward of the City Hospital on May 25th, and, the erysipelas clearing up, was transferred to Dr. Dougherty's service July 1st, during the Doctor's temporary absence. At this time, his chief complaint was severe frontal headache. Ordinarily he was apparently rational, but at times became slightly irrational and tried to tear the bandages from his head. Headache worse in the morning, often absent at night. Patient was up and about the ward. He had no aphasia at any time during his stay in the hospital.

The report of the House-Surgeon, as given by Dr. Knause, was slightly in error in one point—there was a slight discharge of greenish pus from the old wound. The wound of the previous operation consisted of two granulating areas. At every dressing a dram or so of pus exuded. This pus was streptococcic. Blood pressure was never very high, and the day before his death increased 130mm of mercury. He vomited but twice during his stay in the hospital—once the day before death. He ran no temperature until the day of death—it then jumped from normal to 103.2°. See temperature-chart.

On first visiting him, the old wound was ordered curetted and re-dressed, and a request was made that the attending oculist and neurologist examine him. His eyes on entering

the hospital were normal. At no time were vertigo or nystagmus present.

Dr. Pritchard reported that his examination showed a probability of brain abscess. Dr. Strouse reported: Both eyes neuro-retinitis, with venous congestion and dilated vessels.

Lumbar puncture, made July 2nd, yielded about one ounce of turbid fluid, flowing quite readily and apparently under increased pressure. This contained 96 cells to the *cm*, polymorphonuclears 93 %; mononuclears 5 %; undetermined, 2%. No organisms seen. Urine negative. White blood-count never above 10,000.

Ordered prepared for exploratory operation the next day, but during night became unconscious; arms and legs involved in slight clonic spasm; respiration reduced to 10 or 12; coarse laryngeal râles were heard, and the stethoscope showed the presence of many fine and coarse moist râles. When Dr. Dougherty arrived at the hospital he was dead.

The autopsy results were much as Dr. Knause had stated. Abscess of left temporo-sphenoidal lobe; miliary tuberculosis; pulmonary œdema; with parenchymatous nephritis, fatty cirrhosis of liver. The abscess, as large as a walnut, was walled off and surrounded by thickened walls.

Dr. KNAUSE said that, in view of the history given by Dr. Dougherty, one would suppose that the abscess was not present at the time of the operation, but a later development.

Dr. A. WIENER reported the case of a woman 53 years of age, a sufferer from chronic interstitial nephritis, in whom it was necessary to perform an operation for a neglected acute mastoiditis. Five days after the operation, a serous meningitis was suspected on account of the severe headache, choked disc, and the extremely slow pulse with a high temperature. These symptoms were relieved for a time by the lumbar puncture, to be followed on the third day by a pyæmic temperature. A thrombosis of the lateral sinus was suspected and a second operation revealed such a condition present throughout the entire sinus, including the bulb and upper part of the jugular vein. In addition, an extradural abscess was found in the middle fossa. The vein was tied off and resected, the thrombus cleaned out, and the abscess evacuated. For a period of about two weeks the patient did well; then there

was another rise of temperature due to a migratory pneumonia and an acute exacerbation of the chronic nephritis. The patient eventually entirely recovered and the wound is now almost closed. Especial attention was called to the presence of the choked disc, slow pulse, and high temperature as indicative of a serous meningitis, due in this case undoubtedly to the sinus thrombosis.

Dr. HERMAN KNAPP presented the last numbers of the ARCHIVES of OTOTOLOGY, and the *Archives of Ophthalmology*, both being edited in both German and English, and this last number showing a marked advance over the previous numbers.

Dr. GUSTAVE KILLIAN, the celebrated Professor of Laryngology, Rhinology, and Otology at the University of Freiburg, in Baden, has recently joined the editorial staff of the ARCHIVES OF OTOTOLOGY, 1908.

ABSTRACTS.

A CASE OF CHRONIC MIDDLE-EAR SUPPURATION WITH NECROSIS OF THE POSTERIOR LABY- RINTH, FACIAL PARALYSIS, LARGE PAROTID SWELLING, AND PUS TRACKING DOWN BEHIND THE JAW TO THE SOFT PALATE AND TONSILS.

By ARTHUR H. CHEATLE.

Journal of Laryngology, Rhinology, and Otiology, April, 1907.

The patient was a man, aged 22, who had suffered from middle-ear suppuration of the left ear for nearly two years. There had been constant headaches on the left side for six months, swelling over the parotid region for six weeks, facial paralysis for three weeks, and unsteadiness of gait for two weeks. There was no swelling nor tenderness behind the ear. On operating, the mastoid process was found to be diploic and free from disease, and the antrum to be small. A large opening led from the superior and posterior part of the inner wall of the middle ear into a big cavity which was filled with granulation tissue and contained a sequestrum consisting of part of the vestibule and of the semicircular canals. Pus welled up through a ragged opening in the anterior-inferior meatal wall, and the finger introduced passed behind the jaw into a large abscess which pushed the tonsil forward. A counter-opening was made between the abscess and the surface of the neck. Recovery was entirely uneventful. The interesting points in this case were the absence of pyrexia and severe symptoms in spite of involvement of the labyrinth. The parotid swelling was probably glandular. Cheatle considers that the anatomical condition accounts for the absence of signs of mastoid inflammation; the "infantile" type being present.

INFANTILE TYPES OF MASTOID WITH NINETY-SIX SPECIMENS.

BY ARTHUR H. CHEATLE.

Journal of Laryngology, Rhinology, and Otology, June, 1907.

Cheatle describes as "infantile" a diploic mastoid process which is separated from the antrum by a layer of compact bone, and which has a dense outer antral wall,—a condition which is due to the persistence of the infantile type of mastoid. Three plates are given illustrating some of the specimens which were picked out from a collection of 500 normal bones. Cheatle points out the surgical importance of recognizing their frequent occurrence, as in such conditions: (1) suppuration is unable to reach the mastoid process or perforate the outer antral wall; (2) the external signs of acute empyæma of the antrum may be absent or slight; (3) extension of infection is more likely to extend intracranially or to the labyrinth.

ON THE DIFFERENTIAL DIAGNOSIS BETWEEN MÉNIÈRE'S DISEASE AND OTHER CASES EXHIBITING MÉNIÈRE'S COMPLEX OF SYMPTOMS, WITH REMARKS ON THE PRACTICAL VALUE OF THE SETON.

BY T. WILSON PARRY.

British Medical Journal, May 11th, 1907.

Parry briefly mentions the differential diagnosis of these conditions. The case of a hospital nurse, aged 41, is cited, in which the introduction of a seton into the neck (worn for a year) caused almost complete abatement of the symptoms, although for the previous five years the attacks had been so severe as to practically incapacitate her from following her occupation. Parry mentions that a seton can only be expected to give relief while being worn, and to have no further lasting effect. He suggests that the seton, by reflex action, influences the vasomotor nerves of the affected part when in near proximity to it, and thus converts a chronic vaso-dilatation of the vessels (of the labyrinth) into one of normal tone.

FOUR RATHER UNUSUAL CASES OF ACUTE MASTOIDITIS.

BY DR. MATTHEWSON.

Montreal Medical Journal, May, 1907.

The only case of interest is the second in which acute inflammation of the mastoid process occurred as a complication of a fracture of the base of the skull. There was hemorrhage from the ear after the accident, which ceased after two days. Profuse otorrhœa occurred ten days later with symptoms of acute mastoiditis, necessitating operation. Uneventful recovery.

MENINGISM.

BY DR. TYLECOTE.

Medical Chronicle, June, 1907.

In this condition although symptoms of meningitis may be present and death occurs, the diagnosis of meningitis is not confirmed by a post-mortem examination. Tylecote divides meningism into two groups—organic and functional. The former may be due to otitis media, probably the result of intracranial pressure; the latter, which may occur in the course of cerebro-spinal meningitis, mumps, erysipelas, scarlet fever, diphtheria, measles, influenza, typhoid, and perhaps tuberculosis, is possibly the result of some selective action on the meninges and cerebral cortex by toxins circulating in the blood stream. The condition differs clinically from true meningitis in that there is no pyrexia, no wasting, no slowing of the pulse, no irregular respiration, and Kernig's sign is absent. Retraction of the head, perhaps even opisthotonos, may be present, but is of short duration or intermittent. Lumbar puncture is usually beneficial. References are given and also illustrative cases. It is not, however, stated whether the ears were examined, which is a matter of regret.

POLYPOID OVERGROWTH OF THE INFERIOR TURBinate.

BY HAMILTON WHITE, M.D.

Montreal Medical Journal, June, 1907.

The condition is unusual from its papillary form which

simulated papillomata, and from the large size of the mass. The growth was removed by a snare. Photographs and description are appended.

SARCOMA OF THE NOSE.

By DR. WALKER DOWNIE.

Glasgow Medical Journal, August, 1907.

Six cases are cited. The usual position of the growth was the ethmoidal region, or antrum, with secondary involvement of the nose. The ages varied from 13 to 67 years. Clinically the symptoms were those of nasal polypi, but in addition there was frequently spontaneous epistaxis. As a rule there was no pain except when the growth was touched. In most of the cases there was distension and hypertrophy of the nasal bones, but, as Downie remarks, this may also occur as the result of simple polypi. If purely intranasal, Downie recommends removal by punch forceps or curettes followed by the use of the cautery, the treatment probably having to be repeated at intervals. If the septum is involved he suggests Rouge's operation.

THE NASO-PHARYNX AS INFECTION CARRIER IN AN EPIDEMIC OF CEREBRO-SPINAL MENINGITIS.

By DR. FRASER AND DR. COMRIE.

Scottish Medical and Surgical Journal, July, 1907.

This paper is the result of investigations made during the recent epidemic in Leith in which there were 83 cases and 53 deaths. In the nose and naso-pharynx of 13 infected cases examined, the meningococcus was found in two cases. In 69 persons in contact with the cases (all adults and apparently otherwise healthy), the meningococcus was present in 10. 80% of those infected were under 16 years of age. The meningococcus was found in the air of the engine room of a ship in which five of the men who were working were fathers of the children infected. The conclusions deduced are: (1) That the growth of the meningococcus is favored by a hot, dusty, ill-ventilated atmosphere, which also predisposes to the occurrence of a naso-pharyngeal catarrh. (2) That the

comparative high percentage of fathers whose naso-pharynx was found to contain meningococcus, points to the fact that they probably were the carriers of the disease to the children.

(3) Infection of the naso-pharynx is undoubtedly an important factor in spreading the disease. (4) That it is advisable to isolate those in contact with the disease, and if the meningococcus is found to be present in the nose and naso-pharynx, quarantine should be insisted on until the meningococcus is no longer found on two consecutive examinations.

A CASE OF RETRO-PHARYNGEAL FIBROMA.

By N. B. ODGERS, M.D.

British Medical Journal, May 25, 1907.

Odgers describes the occurrence of a retro-pharyngeal fibroma in a woman aged 31, which first came under observation on August 3d, 1906. Since Easter, 1904, she had been unable to breathe through her nose and had some difficulty in swallowing. In May, 1906, she had two attacks of epistaxis. A pyriform swelling, firm, regular, and well-defined could be seen behind the right side of the posterior pharyngeal wall. It bulged forward the soft palate and the right posterior faucial pillar, and filled two-thirds of the naso-pharynx. On October 30th, a longitudinal incision was made along the mucous membrane over the tumor, and the latter was then readily enucleated with the finger. The tumor was the size of a hen's egg. A microscopical examination showed it to be an angio-fibroma with a more or less definite capsule. In February, 1907, there was no sign of any recurrence of the tumor. The condition is a very rare one. References are given to other similar cases occurring in literature.

ON LYMPHOID DEGENERATION OF THE SALIVARY GLANDS.

By S. HANDLEY, M.D.

British Journal of Dental Science, August 1, 1907.

Handley's patient was a woman aged 35, who, for seven years, had suffered from salivary calculus of the left sub-

maxillary gland, causing periodical attacks of swelling and pain of the gland. It was eventually removed by operation. Microscopic examination showed the structure of the gland to be practically indistinguishable from that of a tonsil or of a lymphatic gland. The condition was apparently the result of a chronic catarrhal inflammation which had spread back along the duct of the gland. A similar case by Minelli (*Virchow's Archiv*, vol. 185, page 117) is quoted.

ARCHIVES OF OTOLOGY.

REPORT OF A CASE OF MASTOIDITIS, COMPLICATED BY PURULENT MENINGITIS, ENCEPHALITIS, PHLEBITIS OF SIGMOID-SINUS, JUGULAR BULB, AND INTERNAL JUGULAR VEIN. OPERATION. RECOVERY.

By JAMES F. McKERNON.

(With Temperature Chart on Text-Plate VII.)

THE following case is reported because it presents several interesting features, especially the meningeal and brain complication, which the otologist not infrequently meets with, and seldom with recovery.

The patient, a male aged twenty years, was seen in consultation with Dr. H. D. Chapin, on March 31, 1905. The following history was obtained from his mother. He had always been well, except for the usual diseases of childhood, and a severe attack of articular rheumatism, when he was twelve years of age. Two weeks before he had an attack of follicular tonsillitis, lasting four days, and one week later he complained of a pain in his ear, severe in character, lasting four days, during which spontaneous rupture of the drum-membrane occurred. This was followed by partial relief for five days, when pain became severe again, and he was taken to an aurist who incised the drum-membrane, when he was again relieved of pain for several hours. This recurred again during the early hours of the following morning, and was quickly followed by severe pain, referred to the right

side and top of the head, vomiting, dizziness, restlessness, and groaning, with intense thirst.

Physical examination showed a well-developed adult of twenty years who was exceedingly restless, tossing from side to side of the bed, his eyes tightly closed, both hands clenched, and emitting groan after groan with at times a high-pitched inarticulate sound. Upon opening the eyes he would cry out with pain; the pupils were irregular with but little reaction, the left being smaller than the right; tongue dry and glazed, as were also the lips. The pulse was 100 per minute, full and bounding. Rectal temperature was 104.4, respiration 24. He would lie quietly as though in stupor, when suddenly he would arouse, ask for water, and again become exceedingly restless.

Aural Examination.—In the right auditory canal was found a bloody serous discharge, upon which being removed disclosed a bulging drum-membrane with a small opening in it just above the region corresponding to the eustachian entrance to the middle ear. The postero-superior canal wall was in a state of collapse, hiding from view the postero-superior quadrant of the drum-membrane. Pressure over the right mastoid caused the patient to cry out with great pain, but upon further investigation it was found that pressure upon the other mastoid or any part of the skull brought forth a like response. The left ear was negative. A diagnosis of mastoiditis with meningitis was made and an immediate operation was advised as the only probable means of saving his life, and it was explained to his family that in his present condition, recovery following operation was extremely doubtful. They, however, requested that every effort be made to save his life, and within an hour he was removed to the Post-Graduate Hospital and prepared for operation. A smear from the right auditory canal was taken to the laboratory for examination, and a report quickly given that the infection was that of the *diplococcus intercellularis meningitidis*. A differential blood count was also made which showed a polynuclear percentage of 94, with a leucocyte count of 11,600.

Operation.—Chloroform was given and the usual mastoid incision made. When the flaps were retracted the external cortex was found to be very dark, almost black in color.

Upon entering the mastoid it was found infiltrated throughout with a thin colored serum, with here and there a cell containing thin milky-looking pus. The large medullary spaces posterior to the sigmoid groove contained the same characteristic looking pus and serum as that found throughout the mastoid proper. The bone comprising the zygomatic ridge was extremely cellular and found infiltrated, and was removed in its entirety from a point well forward anteriorly to a considerable distance farther back than where the sinus passes transversely toward the torcular, this removal exposing necessarily the entire floor of the middle fossa in this region. The dura thus exposed was bulging and showed an intense redness over its whole area. It was found impossible to remove all of the diseased bone without making a transverse incision posteriorly, and when divested of its bony covering the entire descending limb of the sigmoid sinus as well as the dura over a portion of the cerebellum was exposed. Here it was free of congestion as compared to the dura covering the exposed area of the middle fossa above. After completing the operation, the exposed dura of the middle fossa corresponding to the roof of the mastoid antrum was incised horizontally over the bulging area, with the result that several drachms of turbid fluid were evacuated, and the dura flaps were retracted and the brain tissue beneath inspected, with negative result. The opening in the dura was not closed, the entire cavity was packed with iodoform gauze, and the patient returned to bed in good condition. The length of the operation was less than an hour. The pus taken from the mastoid as well as the fluid evacuated through the opening made in the dura was examined and found to contain quantities of the same characteristic infection shown from the smear examination, namely, diplococcus intercellularis meningitidis. As the range temperature, pulse, and respiration is here appended, I will not specify in detail as to their variations, as a study of the chart will show them. For several days following the operation, the patient was never conscious, except once for a few minutes. This was on the fourth day early in the morning, and lasted only about five minutes, during all of which time he exhibited many, if not all the symptoms of a typical meningitis. The external dressings on the mastoid had to be changed twice a day,

owing to their saturation, which undoubtedly came from the opening made in the dura. The wound itself was dressed on the third day, showing but little if any repair. Ice caps were kept on almost continuously up to this time. Several lumbar punctures were made, the amount withdrawn showing on the chart. All of the fluid obtained by lumbar puncture was turbid and showed quantities of the same infection as that before examined. The pupils were unequal throughout the entire seven days. The eye-grounds were examined three times during this period with negative results. On the eighth day following the operation the patient regained consciousness, the ice caps were removed and kept off for two days, to be reapplied upon his complaining of severe headache in the region of the wound and vertex. The wound was dressed every day, and both the external dressing and packing were found saturated with fluid, but less in quantity at each subsequent dressing. On the ninth day following the operation, the patient complained of feeling cold, and within a few hours exhibited a rise of temperature to 104.8 F. Believing we had a sinus phlebitis to deal with, I asked permission to explore this blood channel, but was requested by the family to wait. During the next four days there were no rapid excursions of temperature, the variations not exceeding two degrees. There were, however, several evidences of a chill, some vomiting every day, and the patient began to look septic. The wound upon dressing at this time showed but little repair, and where before the dressings had been saturated, they were almost dry. That portion of the sinus divested of its bony covering did not exhibit its usual lustre, was somewhat grayish in color, and looked flatter than the average sinus when exposed. The blood examination at this time showed upon differential count a polynuclear percentage of 90.8 with white cells numbering 7600. The following day the patient's condition was about the same as the four previous days, except that he complained of pain in the neck of the affected side. Physical examination here disclosed tenderness along the anterior border of the sterno-mastoid muscle, and some enlarged glands could be felt. Again operation was advised and this time consented to.

Second Operation.—Chloroform was administered and the sinus exposed for one and three-quarter inches posterior to the

knee above, and down to the bulb below. It was covered throughout its entire exposure with a grayish exudate except the last half-inch exposed. A free incision was made with a scalpel in its anterior wall at about the centre of exposure, and a few drops of pus exuded. There was no bleeding. The operative field was covered with gauze and the neck prepared for the removal of the vein. The internal jugular was exposed, ligated, and resected from the clavicle below to its exit to the skull above, as well as a portion of its tributaries, which were found involved. The lower two inches of the vein contained fluid blood, while all above this was filled with clot. The walls of the vein below at the clavicle were not thickened, macroscopically speaking, but above, just external to the foramen, the walls were found very much thickened. Several enlarged glands were encountered during the course of the dissection and removed. The neck wound was then protected with moist warm towels, and the contents of the sinus above evacuated, where plenty of pus was found, and a large amount of broken down and disintegrated clot. Working back toward the torcular, a firm clot was found completely filling the lumen of the vessel, and upon its removal a free hemorrhage was established from this end. The disintegration below, above the bulb, was very marked, the broken-down clot with pus being about the consistency of thick molasses, and of a reddish brown color. A sufficient portion of the bony wall of the bulb was removed posterior to and below the facial canal so as to permit the passage of a curette into the bulb, and after but little manipulation, free hemorrhage was established in this locality, the origin of the blood being of course from one or both petrosal sinuses. The hemorrhage was apparently as free as we would expect to find it were the vein below intact and performing its usual function (a point which should not be forgotten, as many operators tell us that in phlebitis of the sinus proper, where a free hemorrhage is established here, it is not necessary to prolong the operation, as the blood which is present comes from an unobstructed vein below. This demonstration, as well as many others that have been made, shows us, I believe, conclusively that the source of such bleeding is from the petrosals and not the vein below, as we may have a vein obstructed and still obtain blood from this

region. There was considerable sloughing of the posterior sinus wall extending as far back as the cerebellum, and this was removed by the scissors. The wound above was dressed in the usual way, the neck wound was flushed with a hot saline solution, a cigarette drain was introduced, the opening closed with a continuous silk suture, dressed with gauze soaked in a warm saline solution, and the patient returned to bed in a rather poor condition. For the following two days his condition remained so, although he was conscious, and took a fair amount of nourishment. A study of the chart will show that three days after this operation there was a rise of temperature to 102.8 F. Both neck and cranial wound were now inspected, the former being found in good condition with primary union from end to end. The cranial wound, however, was not in as good condition, as over the cerebellum, where the sloughing edges of the dura had been cut away, there was a protrusion about the size of an English walnut into the mastoid cavity of the cerebellar tissue divested of its covering. This mass was very soft and pulpy, and was removed with the scissors down to its base, and a drain composed of a wick of gauze was introduced into the cerebellar tissue for about three quarters of an inch. The wound was dressed each day only to find mass after mass of disintegrated cerebellar tissue protruding into the mastoid wound. Upon three different occasions these masses were incised freely with the scissors deep into the cerebellum, but in a few hours their place was taken by more tissue of a like character. A further study of the chart will show that for five days after the development of this encephalitis there were wide and rapid variations of temperature, but no evidence of a chill observed. On the seventh day following the operation the wound looked quite as unpromising as the previous days, and after incising and removing more cerebellar tissue, a cotton-tipped probe was dipped in a solution of silver-nitrate, of the strength of 480 grains to the ounce, and the entire cerebellar cavity that was exposed was freely mopped with this application and a large amount of boric acid placed in the cavity, and on this a very loose dressing of gauze was applied. From this time on there was no protusion beyond the surface of cerebellar tissue; there was, however, an abundant slough as the result of

this application. The cavity in the cerebellum began to fill slowly, so that at the end of ten days it was even with the surface and each time the wound was dressed, an application of 360 grains to the ounce of silver-nitrate was made, so that at the end of two and a half weeks the surface presented rather a firm cicatrix, and later it protruded somewhat anteriorly, but always maintaining its firm scar-like appearance on the surface, and finally, as the wound filled in, became covered with skin, and to all appearances became perfectly firm. The neck wound healed without further complications, and one year after operation the hearing on the affected side became normal. The mastoid wound presents the usual post-operative appearance, with seemingly no more fulness than the average. The suture line in the neck, however, presented somewhat of a keloid appearance at this time. I think there can be little doubt that this was a case of purulent meningitis, plus the other complications that were present as cultures made from the fluid evacuated through the dural opening, as well as those made from the fluid obtained by lumbar puncture, showed a true growth of the *diplococcus intercellularis meningitidis*. This brings up the question of early operation in cases of purulent meningitis. It would seem rational to operate early, drain these infected areas, and treat them on general surgical principles rather than to stand idly by and see the vast majority terminate fatally. I believe that in the future this should be done, for even though only one case in several recovers, this in itself is a distinct gain, for now they are nearly all fatal; but, with improved surgical technique, may we not hope for more favorable results in the future.

REPORT OF CASES OF MASTOIDITIS IN THE AGED.

By HENRY A. ALDERTON, M.D.

THESE cases naturally divide themselves into two classes: the first with perforation of the drum membrane and more or less discharge of purulent character through the external auditory canal, and the second without perforation of the ear-drum and consequently no escape of the products of inflammation. Most of the cases reported in this paper were seen during the past two years, either in hospital or private practice.

Class I.

CASE I.—Bernard M., age seventy-one, referred by Dr. OLMSTEAD. General condition, average; had not slept well for three months. Three months before being seen, following a "cold," had a great deal of pain, which persisted for two months in ear, then subsided and located in the mastoid; constant tinnitus in left ear preceding the appearance of pain and continuing; more or less discharge. Examination showed pus in left canal, granulations at fundus protruding through perforation, and surface of drum membrane the seat of a chronic granular myringitis; the region over the mastoid insertion of the sterno-cleido-mastoid muscle was swollen and red and had been so for three or four weeks; on the surface of this swelling was a sac, formed by the elevation of the skin, containing pus; the mastoid region was swollen and tender. The pus sac had existed for only a day or two.

Operation.—The pus sac was incised and about half an

ounce of pus was evacuated; a probe found its way to the inner surface of the mastoid apex. The granulations in the middle ear were thoroughly curetted. The outer table of the mastoid, at the apex, was hard and about $\frac{3}{32}$ of an inch in thickness. On lifting off the outer table of the mastoid process, pus oozed out freely under pressure, the probe immediately sinking through granulation tissues to the medial wall and finding two perforations into the digastric groove, separated by a slender bridge of bone. The bone between this cavity in the tip and the mastoid antrum was very little affected; the cavity in the tip extended well under the sigmoid groove. Patient ran very little temperature before or after operation. Pain was entirely relieved, and patient slept better than he had in three months.

One week and a half after operation, patient began to complain of soreness in the throat. Two days after, moderate swelling appeared in throat just back of the posterior pillar of the fauces on the left side; this swelling was tender to the touch and firm. Dr. JONATHAN WRIGHT was called in consultation and incised swelling without result. Considerable odor to breath, but in the next few days the swelling in throat rather diminished than otherwise; patient complained of some slight pain behind ear, with some frontal headache, but could swallow with comfort. Six days after appearance of throat symptoms, something broke in the throat early in the morning and the patient expectorated two or three mouthfuls of pus. From this time throat gave no further trouble; after the rupture, on syringing through the mastoid wound, some fluid escaped into the throat. Patient then went on to complete recovery. Bezold mastoiditis.

CASE 2.—Charles E., age fifty-seven, referred by Dr. KUHN. General condition poor; has bronchitis and liver trouble. Began to be hard of hearing about one and a half years previously; had had pain in ear off and on for six months following discharge in left ear. Suffered from headaches, constipation, and dizziness; pulse 72, temperature 98.9°. Examination showed marked mastoid tenderness over and around the left mastoid antrum, posterior canal wall bulging, pus in canal, granulations at fundus. Right ear showed

pus in canal and a kidney-shaped perforation, inferiorly, of drum membrane; granulations on promontory.

Operation.—Assisted by Drs. KUHN, HUSSEY, and SHATTUCK. Found large abscess cavity, under intact outer table of mastoid; this cavity was filled with purulent cholesteatomatous debris, under pressure, so that a worm of the material was forced out through the opening made in the outer table. This cholesteatomatous mass had destroyed a large part of the posterior wall of the *osseous canal*, pushing the soft parts before it; it had also disintegrated all cellular structures toward and into the mastoid antrum. A sequestrum composed of the pars tympanicus and posterior portion of *annulus tympanicus*, together with a portion of the floor of the antrum—otherwise, the posterior superior osseous canal wall—came away. Patient made an uninterrupted recovery.

Class II.—Without Perforation of Drum Membrane or Discharge.

CASE 3.—Mrs. Elizabeth P., age sixty, referred by Dr. PEARCE. Seen first April 9, 1907. History: About September, 1906, lost hearing in both ears, following a "cold"; the right ear recovered after a time; no discharge from either ear. From February 1st, was troubled with neuralgic pain over left side of head, especially over occipital region; two weeks ago developed pain and some tenderness behind the left ear; later swelling appeared over mastoid, which gradually extended above ear and backwards over occiput. Pulse, temperature, and respiration normal. Canal normal; drum membrane normal in position, but thick and rather opaque.

Operation.—Incision evacuated pus; outer table over antrum and zygomatic cells necrosed. Great destruction of cellular structure of mastoid process, with exposure of dural covering of the middle cerebral fossa and of sigmoid sinus, which latter was covered with granulations. Necrotic bone was found all through zygomatic cells well forward, and also posteriorly and far back into occipital bone. The deep cells lying under the sigmoid sinus were also extensively affected. Uninterrupted recovery with good hearing.

CASE 4.—Paul R., age sixty-nine, referred by Dr. JOSEPH MYERS, May 1, 1907. Patient had had hardness of hearing

in the right ear for three months; six weeks ago had pain in right ear, lasting three weeks, extending over temporal and parietal regions; past three weeks some headache and considerable deafness in both ears. Patient came for relief of deafness. Examination: impacted cerumen in both canals, after removal of which he heard much better in left ear but not in right; right drum appeared thick and opaque and slightly reddened. External auditory canal was normal. No tenderness over mastoid process. Just posterior to the mastoid apex at its base and over the occipital portion of temporal bone was some swelling deep in over bone, which was moderately tender to pressure; this swelling extended down deep in neck to a point about on a level with the angle of the jaw. Temperature slightly subnormal, pulse normal. General condition excellent. May 3d, operation: outer table of mastoid fairly healthy, on removal of which opposite mastoid antrum a small cavity containing pus was exposed; extending the wound downward to apex through fairly healthy bone, discovered a number of large cells in tip and under sinus wall in towards jugular bulb filled with granulation tissue and pus. The mastoid apex was entirely removed and the cells followed under sigmoid sinus; the sinus wall up to the jugular bulb, by the destruction of the sigmoid groove, was exposed and covered with unhealthy-looking granulations. Immediately below these basal cells, there came a free flow of about a half-ounce of pus from the deep tissues of the neck. The mastoid incision was extended downwards along the anterior border of the sterno-cleido-mastoid muscle, and a blunt dissection was done up to the transverse process of the atlas before the track followed by the pus was reached; as there was also a pocket of pus posterior to the transverse process of the atlas, another incision was made posterior to the sterno-cleido-mastoid muscle and by blunt dissection this pocket was also reached. Patient made an uninterrupted recovery, with the temperature never going above 101° F.

CASE 5.—Mrs. W. B. S., age fifty-three years, referred by Dr. HOXSIE, seen February 29, 1908. Right ear had been troubling her for about one month, following a "cold"; no previous ear trouble; started as a dull ache which lasted about two weeks, when she consulted Dr. Hoxsie, complaining

of very severe occipital neuralgic pains on the right side, worse at night. There was no discharge from the ear, but some swelling of the posterior superior wall of the external auditory canal in its osseous portion; also some tenderness, not at all marked, over right mastoid. Patient complained of considerable buzzing tinnitus. Examination: canal showed sagging of posterior-superior wall close to drum membrane; drum membrane dull and congested, with its epidermal layer roughened and soggy from douchings; slight mastoid tenderness over three points, antrum, tip, and emissary vein. Temperature normal, pulse 100-110, respirations 20.

Operation.—Outer table normal, cellular structure showed here and there throughout areas of softened bone with cells containing pus and granulation tissue; this condition extended above into the zygomatic cells, below into the basal cells, up to the wall of the jugular bulb and around the wall of the sigmoid groove, internally up to the inner table, which was fortunately intact, posteriorly into the occipital bone. The mastoid emissary vein was a large one whose bony canal extended through the occipito-mastoid suture into the occipital bone and so out; it was necessary to isolate this, as it lay in the cellular structure, and in removing an area of necrosis in its bony wall the vein was punctured with free outflow of healthy blood. Controlled by pressure and operation was completed. Uninterrupted recovery with no temperature above 99° F., except the post-operative rise to 100 $\frac{1}{2}$ °.

Through the courtesy of Doctors W. C. BRAISLIN and S. LUTZ the writer is enabled to add two more cases to this report, thus including all of this type that have been operated on at the Brooklyn Eye and Ear Hospital the past twelve months.

CASE 6.—Sebastian H., age sixty-five, patient of Dr. W. C. BRAISLIN; admitted December 18, 1907. About six months before, after sleeping in a draught, developed pain in right ear. Later the ear began to throb; no discharge; no posterior auricular tenderness at that time. This condition never entirely disappeared. About two weeks previous to entrance, pain returned with severity and accompanied by throbbing; still no discharge; about one week later posterior auricular

tenderness appeared. Temperature $100\frac{1}{2}^{\circ}$ F.; pulse 96; respirations 22.

Operation.—By Dr. BRAISLIN: bone sclerosed and on entering antrum some pus and granulation tissue was discovered. On removal of mastoid apex, bone was found softened over sigmoid sinus, which being removed evacuated a peri-sinus abscess, thus leaving the sinus exposed. The patient made an uninterrupted recovery.

CASE 7.—Joshua D., age fifty-six, patient of Dr. STEPHEN B. LUTZ; admitted August 25, 1907. About three months ago noticed fulness and cracking noises in both ears; four weeks later the ears began paining violently and more or less pain has persisted since. Has headaches centred at middle of head, accompanied by considerable dizziness. Examination: right external auditory canal normal, right drum membrane congested but very little bulging; pain not severe over mastoid some tenderness; ear throbbing; left ear normal. Temperature $100\frac{3}{8}^{\circ}$ F.; pulse 94; respirations 20.

Operation.—By Dr. LUTZ: external table comparatively healthy; removal of outer table showed whole of mastoid process, except tip, filled with pus and granulation tissue. Cells in the root of the zygoma filled with pus, and removal of affected bone exposed the dura. There was considerable pus and granulation tissue in the cellular structure posterior to the sigmoid sinus. The patient made an uninterrupted recovery.

A review of the seven cases brings to light the unusual proportion, five to two, which the cases of mastoiditis without perforation of the drum membrane or discharge bears to those with perforation and discharge; and this is all the more remarkable in that Case 2 was probably one of chronic suppurative otitis media before the inception of the attack which finally resulted in operation. Also notable was the absence, in the majority, of any marked systemic disturbance because of the local inflammatory process; headache or neuralgias and sleeplessness being the symptoms mostly complained of, at times with throbbing or buzzing tinnitus, and, in the most of the cases, hardness of hearing in the affected ear.

The character of the inflammation in all was of low grade and long duration, the irritation symptoms not being urgent enough to impress the patient with the necessity for any drastic measures toward their relief; they experienced rather discomfort and uneasiness than any feeling of malaise, and the general condition remained excellent—this notwithstanding the gross changes which had taken place in the mastoid bone, with or without exposure of the covering of the intracranial structures.

Noteworthy, also, was the resistance of brain and its sinuses to the septic foci in direct juxtaposition. This, and the comparatively moderate amount of tissue necrosis, when the duration of the inflammatory process is remembered, must be attributed to the lessened tendency to reactive inflammations which obtains in the later years of life. Cases showing the same amount of tissue necrosis, duration, tolerance of the intracranial contents to neighboring foci of infection and lack of middle-ear involvement we have all met in younger people, but, in the writer's experience, without any such proportional frequency; the uniformly good result of operative interference in all of these consecutive and unselected cases is also remarkable.

Of course, given these pathological conditions, it is to be surmised that a number of similar cases, undetected because the path of infection passed slowly intracranially without drawing the attention of the attending physician to the primarily involved region, have gradually passed into the oblivion of the undiagnosed, and consequently are not obtainable for comparison.

DOUBLE MASTOIDITIS, SIGMOID-SINUS AND JUGULAR THROMBOSIS.

BY SEYMOUR OPPENHEIMER, M.D.

(With Chart on Text-Plate VIII.)

On the night of the 28th of January, M. L., female, aged twenty-two, was seen by me in consultation with Dr. Krause, of Jersey City. The patient had had a recent "grip" spontaneous perforation of the left drum membrane, after earache had taken place. The discharge, at first sero-sanguineous, speedily became purulent. Paracentesis of the right drum membrane had been performed four days later, followed by profuse discharge; temp. range during this period was low. The day before my examination, temp. rose to 103 deg., patient complained of great deafness, with pronounced vertigo, not alone upon moving, but even when lying quietly in bed. Pronounced spontaneous nystagmus was present, oscillations being both lateral and rotary; there has been some nausea and vomiting, and considerable frontal headache; mental condition extremely dull. Tuning-fork tests showed pronounced diminution of higher tones. The left ear showed marked tumefaction, and the posterior part of the drum membrane had a perforation situated in its posterior-superior quadrant. There was slight excoriation of the canal wall, but no definite prolapse. Mastoid tenderness questionable. The right ear showed a central perforation with considerable swelling of the Schrapnellian membrane.

The following day, January 29th, the patient was removed to Mt. Sinai Hospital, Private Pavilion. On January 30th, the labyrinthine and meningeal symptoms had pronouncedly increased, and the patient presented all the evidences of a mastoiditis of a very high grade, on the left side. Culture

showed streptococci infection. Under gas-ether anæsthesia the usual curvilinear incision was made behind the left ear. The mastoid process was very small, and its cortex extremely thick; pus was found in the cells of the tip over the sinus, and under great tension in the antrum. The sinus lay very far forward, encroaching on the posterior bony canal-wall; the antrum was extremely small. A small area of the sigmoid sinus was exposed. All diseased bone having been removed, the operation was completed. Two days later it was found necessary to operate upon the opposite ear. The mastoid process was extremely small, the sinus was displaced very far forward, and lay very superficial. At the second stroke of the mallet the sinus was slightly injured, giving rise to free bleeding, which was, however, easily controlled, the operation being continued. The mastoid process contained but few cells, and was filled with pus; much difficulty was experienced in finding the mastoid antrum, which was extremely small (anatomical explanation of labyrinthine and meningeal symptoms). Temperature 104 deg.; white blood count 19,000; polymorphonuclear count 86%.

Following operation the temperature for the ensuing two days ranged between 101-104 deg. On the third day the temperature remained between 100-101½ deg. At this time the report of blood culture given me was to the effect that five colonies of streptococci were present in each cubic cm. of blood. The patient complained of feeling chilly, very restless and nervous, complained of much headache, nausea and vomiting; no decrease in polymorphonuclear count or leukocytosis.

On the following day it was decided, not on the strength of the clinical manifestations, which were absolutely too indefinite to assume the presence of a sinus thrombosis, but in view of the finding of streptococci in the blood, to explore the sinus. Both sinuses were laid bare by removing the overlying bone, both were incised; there was free bleeding both from the distal and proximal ends of the sinus on the left side; on the right side the wall of the vessel seemed thickened and striated. This corrugated striation I have seen repeatedly in phlebitic processes. Upon incision, at first there was no free bleeding for some seconds, then to be

followed by a sharp gush of blood. The thrombus was not found, being evidently washed out.

Two days later an attempt was made to dress the wound, but considerable hemorrhage took place from the sinus upon both sides; it being the eleventh day after the sinus operation before the packing from the right side could be removed without bleeding, during which time it was impossible to properly inspect the wound. The temperature for this period is showing a very irregular course, the patient apparently losing ground, the slight yellowish tint of the hands suggesting a low grade of sepsis. General physical examination, negative; eye-grounds showed a questionable retinal congestion, possibly a little more on the right than on the left side.

February 16th-19th: Temperature for three days practically normal. Patient looks no better, but feels well. Blood cultures taken on successive days have shown increase in the number of colonies of streptococci in the blood from five to sixty to each cubic *cm*, one culture showing sixty colonies to the cubic *cm*, taken during this period of three days normal temperature.

During this time the Laboratory was hot on my heels to proceed. Very slight indefinite tenderness developed along the course of the right jugular vein, with enlargement of cervical glands.

On the night of February 19th, temperature suddenly rose to 103.8 deg., preceded by a chill. Operation was then determined on, consisting of an exsection of the right internal jugular vein. An incision was made along the border of the right sterno-mastoid muscle. The distal end of the vein was tied off low in the neck, and the dissection carried upward and forward; the tributary veins were ligated and exsected, the jugular then being ligated and exsected as close to the jugular bulb as possible. Slight periphlebitis present below the facial vein, the latter vein apparently normal. The appearance of the jugular above the level of the facial was markedly different from that below this point. The vein was white, firm, flat, densely adherent, with marked inflammation of the lymph nodes about it. A series of enlarged glands along the course of the vein were removed, a cigarette drain introduced, and the neck incision closed. The mastoid

was then dressed, the sinus laid open, and free bleeding established from both ends.

It is interesting here to note that although the jugular had been ligated and exsected, free hemorrhage occurred from the jugular bulb, showing that bleeding from the proximal ends occurs as well as from the inferior petrosal sinus. A blood culture had been taken the day of the operation; the report submitted the following day showed but two colonies of streptococci to each cubic *cm*, as against sixty colonies at the previous culture. This is an extremely interesting point as showing that at the moment bacteria were not being swept into the circulation.

Examination of the clot found in the jugular vein showed streptococci; microscopical section of the jugular clot showed adhering thrombus, with streptococci in the approximating wall of the vein. Three days after the jugular operation, another blood culture was taken, which proved to be sterile.

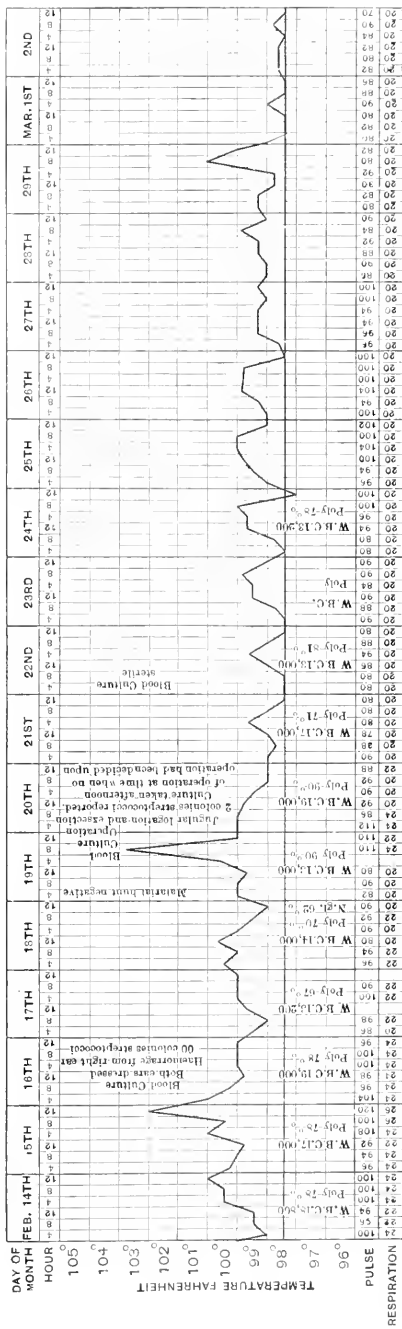
The patient has made an uneventful recovery, the temperature dropping to normal and remaining so immediately after the jugular ligation and exsection.

The points of great interest in this case are the extremely atypical course; the absence of all definite clinical signs of a bacteriemia, although the blood cultures showed streptococci to be present.

To those who place little credence on the polynuclear count in otological surgery, it is interesting to observe the results of daily counts in this case in their relation to the clinical symptoms. Note the sudden polymorphonuclear rise from 60% to 90% on February 29th. Although all who had the patient under observation felt that matters were not progressing satisfactorily, yet nothing was present on which to definitely make a diagnosis of an infective thrombosis.

Furthermore, by a curious coincidence it seems at the times when the reports of blood cultures were received, the patient was invariably in better physical condition, and presented fewer evidences of being ill, which added to the general indecision to undertake additional operative

ILLUSTRATING DR. OPPENHEIMER'S ARTICLE ON "DOUBLE MASTOIDITIS, SIGMOID-SINUS AND JUGULAR THROMBOSIS."



procedures. It is thoroughly borne in mind that patients with infective thrombitic lesions present an entirely different aspect during the remissions of the temperature from that at the time of the exacerbations. Yet by consulting the temperature charts, it will be seen that these were not the low temperatures of a few hours, but rather remissions covering a period of several days.

While I feel as a clinician that it is not for the laboratory to establish the diagnosis of sinus thrombosis for the otologist, yet in cases of mastoidal disease, ante- or post-operative, which manifest an unusual or indefinite course, the value of the blood culture cannot be underestimated, particularly as it has been definitely proven that mastoidal disease *per se* does not produce a bacteriemia.

CASE OF RECURRENT KELOID OF SCALP AND LOBULE OF EAR.¹

By GERHARD H. COCKS, M.D.

(*With Text-Plate IX.*)

Negro man, forty-two years old. His father had a tumor on the neck, and his mother a tumor about the size of a dollar on her arm. I have not been able to determine whether or not these growths were keloidal in character.

Fifteen years ago this man was struck by a glass bottle on the scalp directly behind the ear. The skin at the site of injury was slightly broken. Six months later a swelling appeared. When it had reached the size of a hen's egg it was removed by operation, only to promptly recur. There have been four operations in all, at various hospitals,—the first nineteen years ago, the second two years later, the third two years later still, and the fourth in 1902. At this time skin grafting was done. From 1902 until 1906 the growth has steadily increased in size. The patient seeks relief from the unsightly deformity and from itching. He does not experience any pain.

As shown in the photograph, there are two tumors connected by a linear scar back of the ear. The larger, which springs from the scalp some distance above and behind the auricle, is a crescentic mass $6\frac{1}{2}$ inches long and $1\frac{1}{2}$ inches

¹ Presented before Otolog. Section N. Y. Acad. Med., March 13, 1908.

ILLUSTRATING DR. COCKS'S "CASE OF RECURRENT KELOID OF SCALP AND
LOBULE OF EAR."



wide at its broadest part. The surface of the tumor is irregular, the skin over it is dry and rough. The tumor itself is firm and uneven to the touch. The base is broad. The smaller keloid is attached to the lobule. It is globular in form, pedunculated, and measures about $1\frac{1}{2}$ inches in diameter. In consistency it is not so hard as is the larger fibroma.

On the patient's back, over an area the size of a man's hand, at the place whence skin was taken for grafting, there is considerable hypertrophic scar tissue, as well as about a dozen small keloids, the largest of which measures an inch and a half in diameter, and the smallest about one-third of an inch.

The varieties of growths to be considered in this case are: (1) hypertrophic scar tissue; (2) keloid. Hypertrophic scar tissue differs from keloid in that it never extends laterally beyond the tissue substance which it replaces, *i. e.*, never invades surrounding healthy tissue. It is therefore clear that this variety does not concern us here.

For years it has been customary to divide keloids into two varieties: (a) those that arise at the site of burns, cuts, syphilitic scars, acne, etc., called **scar keloid**, **false keloid**, or **secondary keloid**; and (b) those that are believed to originate in normal and uninjured skin, designated as **idiopathic**, **primary**, or **true keloid**. Of late years writers have been giving up this classification, and now it is considered extremely doubtful that a keloid can arise without some form of traumatism, however slight. The microscopic distinction supposed to exist between the two varieties is that while both tumors are composed of horizontal strands of fibrous tissue which originates in the corium, in true keloid the papillæ with their normal covering of epidermis are seen above the growth, whereas in false keloid only scar tissue exists over the tumor.

Perhaps the best results will be obtained by op-

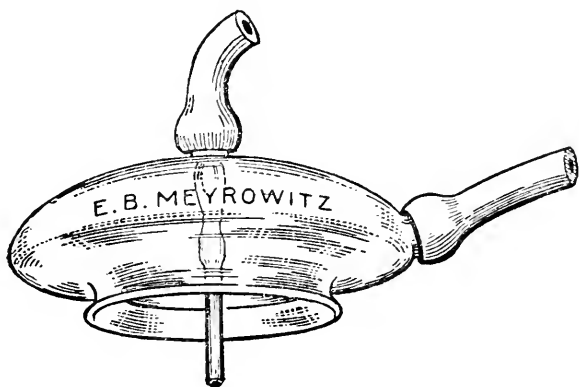
eration, followed by X-raying the scar. It might be better, however, in view of four operative failures, to use electrolysis or thiosinamin injections. Suggestions for treatment are invited from the members of the Section.

A NEW INSTRUMENT FOR THE TREATMENT OF DISEASES OF THE EAR.¹

BY DR. EDMUND PRINCE FOWLER, NEW YORK.

(With two illustrations in the text.)

FOR many years I have been experimenting with syringes, irrigating devices, and suction apparatus endeavoring to obtain one which could be safely intrusted to patients for use at home, and at the same time efficiently cleanse the external auditory canal, and establish and maintain adequate drainage.



I believe I have succeeded in having constructed a very simple little instrument, which not only accomplishes the above, but one having several other actions, which will

¹ Presented at the meeting of the Otological Section, N. Y. Academy of Medicine, April, 1908.

be brought to your attention, during its description and demonstration.

The apparatus consists of a glass bell, so designed that its rim fits accurately about the auricle, wholly inclosing same, preventing any back flow or accumulation of fluid from wetting the patient or those administering the treatment, and subjecting the meatus to no pressure or possible traumatism. From the top and centre of the glass bell projects a nipple, for connecting the apparatus with its source of fluid supply, a fountain syringe. Projecting inward from the nipple is a nozzle, glass in its proximal and soft rubber tubing in its distal portion.

The arrangement is such that this soft tubing can enter the external auditory meatus, taking a direction inward, downward, and forward, thus coinciding with the axis of a normal canal.

The nozzle extends about one half inch beyond the rim of the bell in order that the fluid used may properly irrigate, and the end of the nozzle remain necessarily at a safe distance from the deeper portions of the canal.

On the circumference of the bell is situated the outlet nipple, to be connected with rubber tubing, the latter draining into a washstand basin or any suitable receptacle.

The apparatus being made of glass insures at all times a clear view of the parts under treatment and makes cleansing and sterilizing easy.

A glance at the machine in action will demonstrate at once its perfect safety, simplicity, and cleanliness.

The nozzle velocity will of course vary with the height of the supply bag above the ear, but with the ordinary fountain syringe this velocity will always remain within safe limits. With every foot of elevation, a pressure at the nozzle of about 22mm mercury is obtained. About two feet above the ear is the amount of head usually used by me.

Up to the time I devised this douche my experience with

irrigations administered by the methods usually employed had not been especially pleasing, but in suppurative otitis I could find nothing better to cleanse the canal and promote drainage, and so I used this method. Likewise with suction I experienced only partial success. The apparatus I now show you irrigates safely, efficiently, and simply, but does more, it irrigates in the presence of a partial vacuum. It is this combined action which I especially desire to bring to your notice.

It is brought about by the tight joint between the rim of the bell and the side of the head about the ear and by the syphonage through the drainage tube constantly tending to produce a vacuum, something after the manner of a Sprengel's air pump.

This vacuum is proportional to the length of the drainage tube, and I find that two feet will produce a negative pressure of about 30mm mercury.

Sometimes the suction is not quickly established owing to lack of sufficient fluid in the drainage tube. When this is the case a few moments' pressure on this tube will enable it to fill with the fluid and on releasing the pressure, syphonage and its resultant suction will ensue. The ear will stand very strong suction but I believe the amount mentioned above is sufficient, and in all cases safe and painless even to the normal drum membrane. It is remarkable how much better this combined irrigation and suction establishes and maintains drainage than does either action alone. It draws the pus, detritus, and inflammatory exudate to the surface and the irrigating fluid washes them away. It leaves the tissues clean, and without the boggy appearance resulting from ordinary irrigations.

It produces a combined active and passive hyperemia locally in and about the ear with all the concomitant benefits claimed for this treatment. It gently massages and milks the tissues; it tends to prevent adhesions between the drum and promontory, and to break down any

newly formed. It does all this and more, and for a definite length of time at every treatment, depending on the amount of fluid supplied.

In children it is often most difficult to irrigate the ear without wetting all concerned in the operation, and, with the inexperienced, great harm may result from the struggles of the child causing traumatism to the parts.



When the suction bell douche is adjusted about the child's ear, one hand can steady it and the other hand the head of the child, and it is then almost impossible for the child to wriggle from under control or cause any damage.

In a few irregular skulls, it may be difficult to obtain a tight joint between the glass rim of the bell, and the side of the head. When this is the case, adequate suction may be obtained by encircling the rim with an ordinary half-inch wide rubber band of such length that it will snugly

envelop the edge of the rim and form a cushion to fill up the depressions.

Time will not permit my going into all the virtues of my apparatus, but before closing I wish to demonstrate its action, by the use of a glass model I have had constructed showing the hydraulics of the auditory channels.

This model shows very prettily how under ordinary irrigation it is impossible to cleanse the middle ear through a small perforation in the drum, and how easily the middle ear and even the Eustachian tube may be flushed out by using my douche as follows:

After the douche is adjusted about the ear and suction has been established, pinch the outlet tubing, and make strong pressure on the bell to maintain a tight joint between it and the side of the head about the ear. Continue pressure until the fluid fills the tubing and overflows into the bell. This accumulation of fluid will compress the air inside of the glass bell and external meatus, and necessarily force any fluid from the latter into the middle ear. On releasing the pressure and establishing suction the fluid as you see is easily withdrawn from the Eustachian tube and middle ear and we have accomplished an efficient flushing of these cavities. Note that it is impossible to force fluid into the Eustachian tube unless this passageway is open, and also that not a single drop of fluid has found its way into the mastoid cells.

This latter fact is due to the air pocket contained therein preventing the fluid from entering beyond the *aditus ad antrum*.

At the Manhattan Eye, Ear, and Throat Hospital I have in several cases thus used the douche, and the results of the treatment have been very satisfactory. In the treatment of mastoiditis many of my colleagues have had remarkable results with the suction bell douche and our cases going to operation have been markedly reduced in number since its advent. It is with difficulty that I refrain from going more into detail regarding the uses and

results of treatment with this apparatus, as I am most enthusiastic and confident that it is all I claim for it. Of course it is not adapted to cleansing the ear of inspissated cerumen, and in the case of thick or dried exudates hydrogen peroxide or other means should be used to remove these before the douche is applied.

Perhaps I should mention, before closing, that patients rarely complain of dizziness or tinnitus while undergoing this suction irrigation, and that even little babies seem to enjoy it after they have learned how gentle is its action and how clear it leaves the ears.

I believe its action is along good surgical lines, and I hope its continued use may prove of great benefit to those suffering from otitis media and its complications.

A CASE OF SINUS THROMBOSIS, FOLLOWING
REMOVAL OF GRANULATION TISSUE FROM
THE MIDDLE EAR; EXCISION OF THE IN-
TERNAL JUGULAR VEIN; RECOVERY.¹

BY EDWARD BRADFORD DENCH, M.D.

THE removal of granulation tissue from the middle ear is not ordinarily supposed to be a dangerous operation. Macewen, in his classical work on the *Pyogenic Diseases of the Brain and Spinal Cord*, was one of the first to call attention to the fact that the removal of granulation tissue from the tympanic cavity might lead to serious intracranial involvement, by the opening up of new avenues of infection through the freshly cut surfaces.

The case which I am about to present well illustrates, I think, this fact.

The patient was a young girl fourteen years of age, who came to the New York Eye and Ear Infirmary complaining of a purulent discharge from the right external auditory meatus. The patient said that this discharge had been present since early childhood. For some weeks before the patient came under observation, there had been considerable pain in the ear, which had gradually increased. There had also been some headache and sleeplessness. On examining the ear, I found a profuse, foul, purulent discharge, coming from the right external auditory canal. The meatus was almost completely filled by a mass of firm granulation tissue. On

¹Read before the Otological Section of the New York Academy of Medicine, April 10, 1908.

palpation, the mastoid process was somewhat tender, although this tenderness was not very well marked. Realizing the danger of the removal of the granulation tissue in an outpatient, I advised the patient to enter the hospital. I felt certain that a radical operation would be necessary for the relief of the purulent otitis, but—in order to obtain immediate drainage, and also to secure, by free irrigation of the ear for a number of days, a more aseptic field of operation—I asked my house surgeon to remove the granulation tissue from the external auditory canal as a primary procedure. The patient was in the hospital twenty-four hours before this operation was performed. The temperature on admission was about 99° in the morning, but rose to 101° in the evening. After the patient had been in the hospital for twenty-four hours the granulation tissue was removed, under general anæsthesia, by the house surgeon. On the morning of the day of operation, the temperature was about 99° . In the evening the temperature suddenly rose to $104\frac{1}{2}^{\circ}$ from no assignable cause other than the slight operation for the removal of the granulation tissue. There was no chill, the patient complaining only of slight prostration and slight headache. The temperature gradually fell, so that on the following morning it was normal. On the afternoon of the day after operation, however, the temperature suddenly rose to 106° , and the patient felt slightly chilly. The general condition of the patient was exceedingly good; the pulse was about 120 and of good quality, and, aside from slight prostration, she complained of no discomfort. A blood count at this time showed a polymorphonuclear percentage of about 82, with a considerable leucocytosis,—exactly what, I do not remember. The mastoid tenderness was about the same as when the patient was admitted to the hospital.

Owing to the fact that we had to deal with a case of chronic purulent otitis media, in which drainage had been obstructed for a long time, and in which a sudden rise of temperature occurred from no other assignable cause than the opening up of some fresh avenue of infection, I felt certain that we had to deal with a case of infectious sinus thrombosis, apparently induced by the slight operation upon the middle ear. I proceeded at once to perform the radical operation. Extensive

caries were found in the tympanic cavity, and a typical tympanic exenteration was performed. The lateral sinus was exposed from a point just above the bulb to a point just beyond the knee. The sinus was found to contain a firm clot. The clot was removed by means of the curette, and free hemorrhage was obtained from the torcular end of the sinus. The cautious use of the curette, in a direction toward the bulb, was not followed by hemorrhage, and I proceeded at once to excise the internal jugular vein. The vein was excised from a point just below the omohyoid muscle to a point about one half inch below its emergence from the base of the skull, all tributary veins being divided between two ligatures. A certain number of enlarged lymphatic glands were found overlying the vein, and these were removed.

After excision of the vein, the wound in the neck was closed by interrupted silkworm gut sutures, throughout its entire extent, a small opening being left at the lower angle for drainage, and a narrow gauze drain was inserted throughout the entire length of the wound. The upper angle of the wound was also left open, and a packing of iodoform gauze inserted, in order to shut off the wound in the neck from the divided end of the jugular above. The post-auricular wound was allowed to remain open, but the usual plastic operation was performed upon the auricle, so as to obtain a large external meatus.

The patient made an uninterrupted recovery. The temperature never rose above 102° after the operation, and this was on the day immediately following the excision of the jugular.

About ten days after the radical operation and excision of the jugular, the patient was again placed under general anæsthesia, and the entire cavity resulting from the radical operation was lined with a Thiersch graft; the posterior wound was closed by interrupted sutures. The wound in the neck was by this time completely healed, it having united throughout by primary union. After suture of the post-auricular wound, recovery was uninterrupted. The tympanic cavity was completely dry four weeks after grafting was performed. Microscopic examination of the clot in the sinus and

in the upper portion of the internal jugular showed that the infection was due to streptococcus.

The result, in this case, was certainly most satisfactory. I have reported the case in detail to emphasize the necessity of caution in the performance of an operation so apparently simple as the removal of granulation tissue from the middle ear. I am convinced that in no case should the granulation tissue from the middle ear be removed, excepting where the patient can be kept under close observation. After an operation of this character, the temperature should be taken at frequent intervals, and the patient should be kept perfectly quiet. In this instance, there is no doubt in my own mind that we had to deal with a sinus thrombosis following chronic purulent otitis media, but that the thrombus in the sinus was practically aseptic, or possessed very slight septic qualities, until the granulations in the external auditory meatus were removed. This opened up a fresh avenue of infection, and the clot in the sinus became infected with active organisms, broke down, and systemic symptoms immediately made their appearance.

EUSTACHIAN CATARRH WITH HYPERINFLATION; REPORT OF A CASE.

BY WILLIAM C. BRAISLIN, M.D.

SURGEON, BROOKLYN EYE AND EAR HOSPITAL.

INFLAMMATION of the Eustachian tube in which motions of the pharyngeal muscles involved in swallowing, talking, and mastication produce over-inflation of the tympanic cavity is apparently rare. Such a case recently observed is herewith recorded.

M. H., a young man, clerk in the department of customs, called, complaining of great nervousness due to the following symptoms: He experienced a sensation of fulness in the ears and a slight dulling of the hearing occurring with, or increased by, each act of swallowing, chewing, and talking. There was likewise a sensation when speaking as if he were talking in a hollow, resonant space—the latter a common symptom. His hearing was not greatly impaired. The symptoms have existed in varying degrees since a year ago, when he states, "he took a heavy head-cold." Both ears at times take part in the affection; at present the right ear is worse. He had been Politzerized for a time by a physician, then treated by an osteopath. About five months ago he had an attack of earache.

In addition to the above history I found that as he talks he "sniffs." This, he says, relieves the full, uncomfortable sensation in his ears, momentarily, but when he talks it returns. Eating or swallowing aggravates his symptoms, causing the ears to "fill up," so that he eats rapidly, being very uncomfortable until the mouth is empty, when he again "sniffs"

and by this means relieves the "fulness of his ears" until the next act of talking, swallowing, or masticating.

Posterior rhinoscopy revealed some hypersecretion at the mouths of the tubes. Valsalva's experiment exaggerated his symptoms. Blowing the nose also increased his discomfort. Politzerization increased the degree of his symptoms. Contraction of the levator and tensor muscles of the palate, tending to draw open the Eustachian tube, ordinarily relieves the discomfort of tubal obstruction in its milder forms. In this case all motion of the throat aggravated them. The patient obtained partial relief by strong, quick inspiration through his nose—an emphatic form of the act commonly termed "sniffing." This relief lasted only until the next act of swallowing, speaking, or chewing.

Gomperz (ARCH. OF OTOLGY, xxv., 1896, p. 407) described a somewhat similar condition observed by him, in a paper entitled: "Typical Alteration of the Tension of the Membrana Tympani in Valvular Occlusion of the Eustachian Tubes." In his cases there was bulging of the postero-superior quadrant, otherwise the drum membrane was normal. Gomperz gave the symptoms of this disorder as fulness in the ears, slight noises, and occasional deafness, while the most cautious blowing of the nose created a feeling of air striking against the membrane. In my case the obstruction in the tube offered no bar to the ingress of air but only to its exit. I believe these cases occur in tubes with an unusually patent lumen; but on the occasion of an inflammation partly closing the tube, probably at or near the pharyngeal mouth, so that temporary condensation of the pharyngeal atmosphere easily overcome the resistance which the swelling imposes, Gomperz saw some bulging of the *Mt.* I noticed none at any of the several examinations made. Relief to my patient was rather easily effected. Inflations of air or vapor of all sorts were omitted after a preliminary trial. Applications were made to the mouths of the tubes. A posterior hypertrophy of the turbinate of one side was snared off. A slight recurrence appeared after about six weeks, but quickly subsided. At present he is free from any discomfort referable to the ears.

DO NOT REMOVE THE THROMBUS!

BY DR. F. VOSS OF RIGA.

Translated by Dr. GERHARD H. COCKS, New York, from *Zeitsch. f. Ohrenhkl.*, Vol. LIII., p. 315.

NOW that we are in a position to look back upon a long series of operations for otitic sinus thrombosis it is time to attempt a revision of our operative methods.

Little need be said of the **skin incision**. In the last few years I have sutured the upper part of the retroauricular rectangular incision, and have often fixed the lower edges of the cut with a pair of stitches. The lower and posterior angles should remain open for drainage.

The incision in the neck for ligation of the jugular must not be closed. A gauze tampon is introduced into the sheath of the vessel. If the jugular is already thrombosed, the upper thrombosed end remains to serve as a natural drain. The ligature on the lower and sound end of the vessel is cut off short. At the first dressing the upper end is drawn down by slight traction upon the suture and the end of the vessel is cut off close to the ligature.

The **bone operation** must be described in more detail. For 4 years I have maintained, in cases of sinus thrombosis connected with healed otitis media acuta, that the sinus should be exposed without previously opening the mastoid antrum. For all other cases my rule is to remove diseased bone, wherever found, at the time of the sinus

operation, whether I am performing the radical or the mastoid operation for acute cases.

All spots in the bone which show even slight pathological changes should be followed up. This course has led me to the sinus, when no sign of its disease could be discovered.

A man 25 years old, whose ear had previously been healthy, 4 weeks before admission to the hospital complained of chilly sensations and arthritic pains. After a few days he noticed pain in the right ear accompanied by purulent discharge. One week before admission there was a post-auricular swelling which soon disappeared. When admitted, Jan. 19, 1902, T. was 37.4° C, sensorium completely free, eyes normal, pulse regular and strong, 84. Heart and lungs negative. In the right auditory canal was a moderately abundant purulent secretion. Canal swollen, perforation not visible. The entire mastoid showed moderate oedema and tenderness upon pressure, the latter being especially marked at the tip. Jan. 20, pulse 84-90, T. 36.8° - 37.3° C.

Operation, Jan. 21. The entire mastoid tip was destroyed by pus and granulations. The soft spongiosa was easily curetted away down to the jugular bulb, which was healthy. The antrum was also filled with pus and granulations. While examining the bone cavity, a brownish red discoloration was seen in the upper posterior part of the spongiosa. When cut away, a drop of foul-smelling pus was exposed. The skin incision was then prolonged by a horizontal posterior cut, and the bone operation continued. I next came upon a walnut-sized epidural abscess, lying over the horizontal limb of the sinus. The sinus wall was thickened, reddish-brown, and sunken. A thrombus 4cm long was found at a distance of about 4cm from the knee. At both ends the sinus appeared to be healthy. No ligation of the jugular. Excision of the sinus wall. The thrombus was reddish-brown in color, solid, not broken down. The skin flaps were fixed in position by two sutures and the wound packed. The patient made an uneventful recovery.

This case shows conclusively what rôle diseased bone

plays. From an inconspicuous, slightly discolored spot, a small channel passed 4cm through surrounding healthy bony tissue to an epidural abscess and thrombosed sinus. The knee, descending limb of the sinus, and bulb were perfectly healthy. Clinically there was no proof of sinus disease. Only the systematic removal of the diseased bone led to the discovery of pus in an unusual location. The jugular was not ligated because the thrombus was undergoing absorption.

From the moment that we begin exposing the sinus we must constantly bear in mind that unnecessary manipulation of the same is highly injurious. Sponging should be done as carefully as possible. Throughout the operation we must remember the danger of dislodging portions of the thrombus into the general circulation where they will cause metastases. This possibility should influence our actions and regulate our treatment.

The aural surgeon uses, almost exclusively, mallet, chisel, and bone forceps. The latter instrument, in my opinion, is dangerous and should be discarded. In the next to the last annual report of the Halle Clinic (*Arch. f. O.*, Bd. 65, pp. 55-137), I read that sinus injuries have increased of late. On pages 111 and 113 it is directly stated that these injuries resulted from the use of bone forceps.

After exposure of a sinus **all palpation to diagnose the presence of a thrombus is absolutely contraindicated.** The statement, **Do not remove the thrombus**, cannot be reiterated too often. I wish to protest against Whiting's remarks, "that a thrombus completely obstructing the sinus may be recognized without difficulty by inspection and palpation." Directions follow: "With parietal thrombi we depend almost entirely upon palpation." In the description of the method of removal of an obturating thrombus of the jugular bulb, Whiting writes: "The supposition that a freshly formed and loosely adherent thrombus can be torn away from the vessel wall and dis-

lodged into the general circulation is scarcely tenable. The danger is exceedingly slight, provided, when exercising the attempt, that the necessary precaution is observed" (namely to palpate in a direction from the bulb toward the torcular).

The following case shows how easy it may sometimes be to dislodge a thrombus.

On Aug. 8, 1896, an 18-year-old patient was admitted to the hospital with a history of bilateral suppuration since childhood. The pus had always been foul-smelling. There had never been any discomfort until 4 days previously, when sharp pain in the left ear with headache confined to the left temporal region was experienced. The temperature rose above 39° C. Examination at the time of admission showed tenderness to pressure over the left mastoid process, especially posteriorly. After the removal of a small polyp the malleus and a remnant of the drum were seen. Slight purulent secretion present. As the pain and tenderness continued, an operation was performed Aug. 10th. At a depth of 1cm a cholesteatoma the size of a bean was found. The wall of the posterior fossa was absent over an area about 2cm in diameter. The dura was covered with dark red granulations and sticky pus. While sponging I noticed a linseed-sized coagulum on the sinus wall. As this was wiped away it gradually unrolled and proved to be a blood-clot 5-6cm long, about as thick as a knitting-needle, which had been floating in the sinus stream. There was some bleeding from the lentil-shaped perforation in the sinus wall. Plastic-bandage. At the second dressing the aperture in the sinus had closed. The patient made a good recovery, although a large retro-auditory opening persisted. I have not found, either in reports of operations or autopsies, a single case which showed a clot of this length floating in the sinus. If the vessel had been stroked to empty it of blood or for diagnostic purposes, this clot, which had so slight a point of attachment, would surely have been dislodged into the general blood stream and have caused infarction.

The diagnosis of the presence of an obturating thrombus

can be made by the eye and aspirating syringe. It is essential that the syringe be air-tight and the piston easy to draw. The glass recording syringe now in the market, holding 2g, meets these requirements. The 1gr size is not reliable.

The puncture should be made as soon as the sinus is exposed, because many a sinus that appears normal to the eye, turns out to be thrombosed. Often about a half gram of dark fluid can be obtained in the syringe. If this is now squirted out upon a white background, we are able to recognize that it is brownish-red and not venous-colored. Furthermore, only a limited amount of this fluid can be withdrawn, the barrel of the syringe remaining partially empty. This last serves as a point of differentiation from a pervious vessel. If the puncture into the sinus is made with the paracentesis needle or small scalpel, the distinctive color of the fluid cannot be discerned, because the darkly colored dura obscures our appreciation of the color.

When reading published reports of operations we note an oft-repeated inconsistency. While it is stated that the external appearance of a sinus is no indication of the condition of its contents and that an apparently sound sinus may often be completely thrombosed or even filled with pus, yet we see between the mastoid operation (with exposure of sinus) and the sinus operation intervals of 2, 4, and even 6 days. Writers repeatedly express astonishment at finding a sinus completely thrombosed when it seemed healthy at the first operation. They venture the suggestion that the thrombosis must have existed previously. The aspirating syringe will clear up the situation at once and thus spare the patient the danger of a second and unnecessary narcosis.

My rule now is, in every case where sinus thrombosis is suspected, to straightway expose the sinus and aspirate. If the presence of a thrombus is verified, the operation

is interrupted while the jugular is ligated and divided. We then freely expose the sinus, going $1-1\frac{1}{2}$ cm into healthy parts. Centrally we proceed only as far as the neighborhood of the jugular foramen, which must not be opened, lest we disturb the obstruction, which is often very firm.

THE ATTACK ON THE SINUS.

The sinus should be opened at the same session at which we determine the existence of a thrombus. Whiting lays emphasis upon caution in making the incision to avoid injury of the visceral wall, and states that he has seen this accident happen. He gives the following directions: "The incision should be large enough to enable the operator to introduce a small curette into the sinus and to manipulate it comfortably both forwards and backwards, with great caution on the visceral, but energetically on the parietal wall."

The goal is the complete removal of the entire thrombus. The Halle Clinic pursues the same course, as shown in the yearly report for 1898, where the sharp curette is frequently mentioned. As a motive for this energetic treatment it is alleged that the sinus must be completely freed of its septic contents. The curetting is continued, until, as Whiting expresses it, "the circulation is again restored," *i.e.* until ordinary bleeding shows that the lumen is again patent. "The bleeding should not be checked too thoroughly or too quickly since loosely adherent particles, which have eluded the curette, may often be washed away." I believe this position is the same as that held by the Halle Clinic and its pupils, Leutert, Grunert, etc. The parietal wall of the sinus is merely incised; in exceptional cases, if very much changed, it is partially excised. Hemorrhage is controlled, according to Whiting, by packing gauze into the incision or by tampons passed into the bulb, in Halle by tamponing into the lumen in both directions.

Is the ideal goal of these writers, namely, complete removal of septic material, really attained? If we were dealing with a vein in an extremity, the thrombosed portion could be ligated and excised, and a clean wound thus obtained. In the case of the sinus, where ligation and excision cannot be executed, a clean cavity is an impossibility. Energetic curettage can only diminish the amount of septic material, never remove it in its entirety.

The question may well be asked, does not this energetic treatment cause certain dangers, not formerly present, which are injurious to the already weakened patient? The answer is found in the annual report of the Halle Clinic: "We have repeatedly seen patients unexpectedly collapse in the course of after-treatment, and often the condition was so grave that death would have intervened, had it not been for the speedy employment of energetic measures" (*Arch. f. O.*, Bd. 65, S. 71). It seems to me that the cause of the patient's weakness is the energetic bleeding to which he is subjected, both at operation and later, when the wound is dressed. Numerous instances may be found in the Halle reports.

We are told by Whiting to use the sharp curette "with great caution on the visceral wall, but energetically on the parietal." Notwithstanding this caution, surely exercised in Halle, we see in the autopsy report from this clinic (*Arch. f. O.*, Bd. 62, S. 141), "On the medial wall of the lateral sinus was a defect the size of a pea, corresponding to a similar hole in the cerebellum. Not a trace of pus was found at either place, showing that the perforation was probably an artificial one."

To summarize our objections to the too energetic method portrayed above, we find:

1. That it is impossible to completely remove all septic material from a sinus; we can merely diminish the amount.
2. The dangers, especially of hemorrhage, are not merely imaginary, for repeated and severe collapses

have been observed, particularly during after-treatment.

3. Injury of the brain by the sharp curette is not only possible, but has actually been observed.

Taking these facts into consideration, it is high time to cry: **Away with the sharp curette! Do not remove the thrombus!**

But what shall we do? I have already said that it is often possible, in the case of a thrombus not broken down, to aspirate a half gram of brown fluid. This fluid, together with subsequent products of decomposition of the thrombus, causes the high fever and must be eliminated from the system. Simple incision of the sinus wall is not sufficient, the wall must be excised throughout its entire extent.

My method is as follows: the sinus wall is incised over the entire length of the thrombus. The incision not only reaches to the end of the clot, but $\frac{1}{2}$ – $\frac{3}{4}$ cm beyond. Then the entire outer wall of the sinus is cut away with scissors, so that the thrombus, throughout its entire extent, is freely exposed. The thrombus itself is allowed to remain *in situ*. **Free drainage of the infectious material is now assured**, and we can leave the thrombus to its fate. After inserting gauze, in many cases I have sutured, in part, the skin wound over it, taking care to leave apertures through which the packing can later be removed.

According to this method I have operated 48 cases of sinus thrombosis with 17 deaths, a mortality of 35.42%, and a cure of 64.58%, in a disease which gave a mortality of 92.6% in pre-operative days (statistics from the Berlin University ear clinic—2 cures in 27 cases—*Arch. f. O.*, Bd. 56, S. 72). These statistics embrace, in all, 111 cases. Of the remaining 84, 52 died, *i. e.*, 61.9% mortality. But 16 cases must be subtracted, where the cause of death was other than sinus thrombosis. There remain, then, 68 cases with 36 deaths, a mortality of almost 51%. The mortality of my own series of cases, without deductions, is 35½%. Unfortunately the Halle

statistics have not yet been published, and a comparison with the results of that clinic is therefore impossible.

In the **after-treatment** of the operative cases general surgical principles should be followed more closely than reports from various clinics seem to indicate. If we provide free drainage, it is not necessary to use the curette in the sinus, to irrigate through the jugular vein to dislodge small particles of thrombotic material, or even to press upon the side of the neck to evacuate pus at the base of the skull.

The author holds that the continuance of post-operative fever, of the pyæmic type, is not due to the presence of thrombus rests, centrally situated, but rather to insufficiently free drainage of septic products.

FOREIGN BODIES IN THE NASAL CAVITY AS A CAUSE OF MAXILLARY EMPYEMA.

BY DR. G. KREBS, HILDESHEIM.

Translated by Dr. GERHARD H. COCKS, New York, from *Zeitsch. f. Ohrenhkl.*, Vol. LIV., p. 141.

IT is not generally recognized that foreign bodies in the nose may induce suppuration of the accessory nasal sinuses. I have not found this etiological factor of empyema mentioned in the text-books or literature to which I had access. Prominent writers dispute the fact that suppuration of the nasal cavities (such as occurs from the long-continued presence of a foreign body) arises without the existence of a phlegmon or periostitis of the accessory sinuses. For example, G. Killian¹ writes: "It is questionable whether purely mechanical infection occurs from purulent material being carried into the sinuses from the nose." Further, Zuckerkandl assumes the extension of chronic inflammations from the nose into the sinuses without proving this fact.

This proof I hope to furnish in the two following histories.

CASE I. M. M., 11 years old, whose family history is good, came to me in June, 1901, complaining of nasal obstruction.

Examination: Slightly hypertrophied pharyngeal tonsil; left nasal cavity normal; right nostril contains a foreign body covered with a hard crust and considerable foul smelling pus. This foreign body, when removed with Hartmann's

¹ Heymann, *Handbuch der Laryngologie und Rhinologie*, iii., 992.

forceps, proved to be an infant's rubber nipple. Neither mother nor patient suspected its existence. It had been present in the nose since the child was fed with a bottle, at least seven years.

Fourteen days later I saw the patient again. The nasal obstruction was entirely relieved. Examination of the left side showed a stream of thin pus coming down from the posterior part of the hiatus semilunaris above the inferior turbinate. There were no ulcerations or carious spots. On transillumination of the sinuses the right antrum and the right pupil were dark. Trochar puncture disclosed a large amount of pus in the maxillary antrum. The child's parents refused operation.

On March 22, 1907, I again examined the patient, now grown to womanhood. She did not complain of any nasal symptoms. Examination: left nostril normal; in the right nostril, filling the hiatus semilunaris from the anterior to the posterior end, was a yellow, shining tumor, somewhat granular on its upper surface, and having a broad base. Pus flowed over the upper posterior surface, apparently from the mouth of the maxillary antrum. Transillumination of left frontal sinus clear, right less so. Left maxillary antrum bright, right very dark. Teeth healthy. The right antrum was irrigated through the natural opening with a Hartmann canula, and a large amount of yellow foul pus washed out. Probing and irrigation of left antrum revealed nothing abnormal. A second transillumination of the antrum after irrigation showed the same dark spot as before. The patient refused further treatment, as she experienced no annoyance.

It is reasonably certain in this case that a maxillary empyema is present (and perhaps also an empyema of the frontal sinus). That this is the result of the presence of a foreign body in the nose for a number of years, which produced a purulent rhinitis, is highly probable, especially in view of the absence of the usual causes of antral suppuration, such as carious teeth, syphilis, etc. The second case is more convincing, because I had an opportunity of examining the nose before the lodgement

of the foreign body, and of assuring myself of the healthy condition of the sinuses.

CASE 2. W. S., farmer, 33 years old, always healthy, came under my care because of nasal obstruction, left side.

Examination: large solitary mucous polyp left nostril, springing from hiatus semilunaris. No pus, all accessory sinuses clear on transillumination. The polyp was removed with a wire snare. The following week I again examined the patient and did not find the slightest symptom of sinus disease.

On October 1, 1907, the patient returned to my office with the following story: After the polyp operation the nose was entirely healthy. In October, 1906, while working a thrashing machine, he noticed that a grain of corn flew into his left nostril. When breathing he felt it move forward and back, but did not succeed in blowing it out of the nose. During the following week the left nostril became more and more obstructed and a yellowish red discharge appeared, inflaming the margins of the introitus.

Examination of left nostril: at the introitus eczema and rhagades. The left nasal cavity is filled with purulent secretion. On the floor is a large movable tumor. Above, the tumor appears to extend into the middle meatus. At this point the secretion assumes a fibrinous character, making it impossible to accurately define the limits of the tumor. The entire mass was removed without bleeding by slight traction with a forceps. The tumor is torpedo-shaped, about 5cm long, 2cm thick; superior surface partly smooth, partly uneven, the consistency and color in places exactly the same as is the case with a nasal polyp. In other places the growth is redder and softer. On the edge of the tumor is a grain of corn.

Microscopic examination (Kgl. Path. Institut zu Göttingen) showed that the tumor consisted of organised connective tissue. After removal of the growth the left nostril appeared inflamed but not ulcerated. Point of attachment of tumor not discernible. Transillumination of accessory sinuses shows great opacity of the left antrum of Highmore. Irrigation through the natural opening gives a large amount of thin pus filled with floccules. A second transillumination after

irrigation still shows a black shadow over the maxillary sinus. For a fortnight the antrum was daily irrigated with boric solution. The suppuration finally ceased, and the antrum transilluminated clear. Five months later I again examined the antrum and found it healthy.

Summary.—A grain of corn lodges in the nose of a man whose accessory sinuses are known to be normal from previous examinations. The respiratory current moves this foreign body, perhaps forcing it into a niche in the hiatus semilunaris. Unfortunately the exact location could not be ascertained. It is certain, however, that the foreign body did not lodge in the antrum, for it was afterwards found imbedded in a tumor lying within the nasal chamber. The irritation of this foreign body caused a remarkably abundant growth of granulation tissue, which in the course of time became organized. This large granulation increased the nasal secretion, so that eczema of the nasal introitus occurred. The darkening of the maxillary antrum, after irrigation, showed that the antral mucosa was strongly inflamed. Probably the infection of the antrum occurred not long after the lodgement of the foreign body.

The mode of infection, since there was no extension of an inflammatory process by otitis or periostitis, must be assumed to be aspiration into the antrum of nasal secretion caused by the irritation of the foreign body.

Cases where foreign bodies have lodged for long periods within the nose are not frequently observed. All such patients should be carefully examined to determine the presence of an empyema of one of the accessory sinuses. These people invariably experience such an amelioration of their suffering immediately after the removal of the foreign body that the empyema causes very little annoyance. Therefore we must depend upon the objective examination to determine the exact condition of the sinuses.

OTITIC SINUS THROMBOSIS AND PYÆMIA.¹

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Translated with permission of the author by Dr. GEO. E. DAVIS, New
York, from the *Oesterreichische Aerztezeitung* 1907.

(With three text illustrations.)

I BELIEVE I am justified in reporting the present stage of research in the matter of otitic sinus thrombosis and pyæmia, inasmuch as this research deserves consideration beyond the limits of otology proper.

I shall in the first place speak about the operative procedures on the veins and the venous sinuses and explain the importance these operations bear from the view of operative treatment of pyæmia in general and what the value of this method of operation is according to results.

Otitic sinus thrombosis is caused by infection of the sinus contents by continuity or metastasis from middle-ear suppuration.

It is possible also that by the infection of the smaller veins the disease may extend directly to the large sinuses (osteophlebitic-pyæmia). Otitic pyæmia is therefore always associated with the existence of a sinus phlebitis that is connected with a more or less extensive thrombosis. By thrombosis the sinus lumen may become completely

¹Read at the meeting of the Medical Society in Vienna on May 31, 1907, with demonstration of specimens.

impervious (obstructive thrombosis) or the sinus remains still permeable (parietal thrombosis). Both forms of thrombosis must be designated as "infectious thrombosis." On the other hand we may state that in cases of large extradural abscesses the sinus is compressed and hereby—in a purely mechanical way—a sinus thrombosis may occur. It is a matter of course that such a thrombosis has nothing to do with pyæmic or inflammatory thrombosis, yet without doubt in almost all cases this represents only a transitional state, and that the infection of the thrombus occurs from the abscess after a more or less short period. In this case the endophlebitis will be preceded by a periphlebitis and it is now uncertain whether the infection of the sinus contents is caused by penetration of the micro-organisms, or by absorption of toxins. The infection may be imparted to the entire body from the diseased sinus and this, properly speaking, is the time when the pyæmia and—in some rare instances—the bacteræmia begin. With rare exceptions the bacteræmia, after a few days, is followed by death owing to the greater virulence of micro-organisms, whereas pyæmia leads to metastatic, purulent inflammations.

The chief way for the establishment of the metastasis is by means of the external jugular vein of the diseased side, principally in the centrifugal direction of the veins; however, the metastasis may occur through a healthy sinus by means of the jugular vein of the well side (retrograde transmission).

The anatomical relations of the temporal bone and the venous sinuses is of the greatest importance in causing infections of the sinus from the ear. A large venous plexus extends between the brain and the temporal bone, the peripheral chief branch of which is the lateral sinus and the central branch of which is the sinus cavernosus. Between the two extends the sinus petrosus inferior, the sinus petrosus superior, and the sinus petro-

squamosus, the latter being typically present in children and sometimes persisting in adults. If therefore a purulent inflammatory ear disease extends to the endocranium we already have the danger of a sinus infection on account of the relative position of the ear and the sinus. But the base of the pyramid also shows a close relative position to the veins. Below the tympanum lies the bulb of the vena jugularis interna which is sometimes separated only by an extremely thin bone-plate and sometimes is in direct contact with the tympanic cavity in consequence of dehiscence of the floor of the tympanum. Whereas, before, the infection of the bulb was considered to be rare, we now know that it not only frequently represents an accompanying phenomenon of an infection of the sinus sigmoideus but in a good many cases the bulb is the vein region that is first infected. On account of the close approximation of the sinus to the ear the disease can easily spread to the large sinuses of the brain (sinus lateralis, sinus sagittalis), the vena jugularis interna, the sinus condyloidei, the veins and sinus spaces of the vertebral column.

According to the position of the metastasis we may distinguish four kinds of otitic pyæmia: pyæmia with intracranial metastasis, with metastasis in the thorax, in the abdomen, and with metastasis in the muscles and joints. Of course we sometimes meet with cases changing from one form to the other. Especially in cases of chronic pyæmia ending with death the entire body may be affected by metastases; however, from the clinical point of view, we may with good reason hold to the four forms stated above.

Reports, from the time previous to operative treatment, show that the intracranial metastasis by far exceeds the others in number and importance and, among the intracranial diseases, we again find that the purulent meningitis occupies the first place; then follow in order the cases with metastatic lung abscesses and then the

muscle- and joint-abscesses. Proportionally we seldom find metastatic suppurations in the great abdominal glands (spleen abscess).

Purulent pleuritis or peritonitis in almost all cases is caused by the perforation of neighboring abscesses. Only once have I observed a metastatic pericarditis.

The result of otitic pyæmia depends upon the progress of the local disease and that of the metastasis. If the thrombosed sinus shows purulent ichorous contents, either thereby, or by way of metastasis, a purulent meningitis may be produced. And we may tell by that fact alone that at the time when no operation was made in such cases the purulent meningitis was the cause of death in otitic pyæmia. Moreover the metastasis in the thorax and abdomen will, after perforations of the abscess, finally lead to purulent pleuritis and purulent peritonitis. Treating muscle metastasis is less dangerous; we, nevertheless, also observe here that the abscesses will sometimes extend for great distances between the layers of the deep muscles before a spontaneous perforation takes place so that even a perforation to the outside may not heal.

The general conditions may become still more unfavorable through the fact that, by the influence of the micro-organisms contained in the body and the absorption of toxins, very soon a fatty degeneration of all big glands, kidneys, and the heart muscle will take place whereby the vitality of the patient is the more diminished and the fatal end hastened.

From the above we see that otitic pyæmia from its inception is a surgical disease and this is especially to be emphasized when we compare otitic pyæmia with pyæmic diseases having their origin from other parts of the body. In exceptional cases otitic pyæmia may progress favorably by the spontaneous healing of the metastasis and the sinus thrombosis may heal by perforation of the purulent disintegration of the sinus contents, that is to say,

by the formation of an extradural abscess and with connective tissue obliteration of the sinus.

However we must first of all regard these cases as occurring very seldom and that the patient then is only

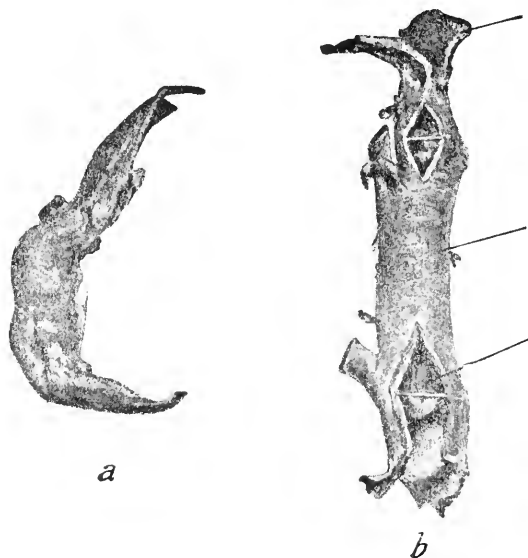


Fig. 1.—*a*. Thrombus from the sinus lateralis gradually tapering to a point.

b. Vena jugularis of the same case extirpated with the bulb and filled with thrombosed matter and pus. Healing. Natural size. (Anton F., op. September 8, 1905.) (Case of Politzer's clinic.) Also see Alexander, *Surgical Diseases of the Ear*, in Albert-Hochenegg's book on surgery.

released of the danger of thrombosis or pyæmia, while on the other hand the extradural abscess or the resulting acute or chronic purulent mastoiditis necessitates surgical treatment.

It is now necessary to refer to the anatomical form of the thrombi (Figs 1-3). The parietal thrombi are more or less flat, terrace formed, often linear or pointed. They are frequently accompanied by a circumscribed periphlebitis corresponding to their position. The obliterating thrombi (Figs. 1 and 2) are cord-like, cylindri-

cal, and gradually taper to a point. Thus thrombi that are not too long will show a typical spindle form. The obturating thrombus only fills the lumen of the vessel completely in its middle part whereas the two ends will extend into the lumen of the sinus which contains blood.

Of greatest importance is the fact that these ends are rather long so that under these circumstances the obturating part will only be about a third of the entire length of the thrombus. The thrombi of the bulbus correspond in their form with the flat surfaces or globular depressions of the bulb (Fig. 3). The jugular thrombi are mostly irregular, string formed, and provided with knots or club shaped processes (in accordance with the incoming vein branches).

In the majority of cases the purulent inflammatory changes of the thrombus are most advanced in the middle part of the same and from there they extend to both ends. In consequence thereof we shall then find the middle part of the thrombus yellowish gray or discolored and both ends deep red. This macroscopic condition, however, does not speak for the non-infectiousness of the thrombus, which usually in its entire length is filled with micro-organisms, indeed, in some cases the middle ichorous part proves to be sterile (the micro-organisms therein having been destroyed) whereas from the dark-red thrombi-ends pure cultures can be developed. Irrespective of this fact there are cases—by no means rare—that show destruction of the thrombus beginning at the ends. We shall still later on have occasion to consider these facts and we must also remember that the obturating thrombus extends far beyond the obstructed section of the sinus into that containing blood.

The symptoms of sinus thrombosis are substantially those of pyæmia—intermittent fever and chill, spontaneous pain, and pain due to pressure on the mastoid and in the frontal and occipital regions.

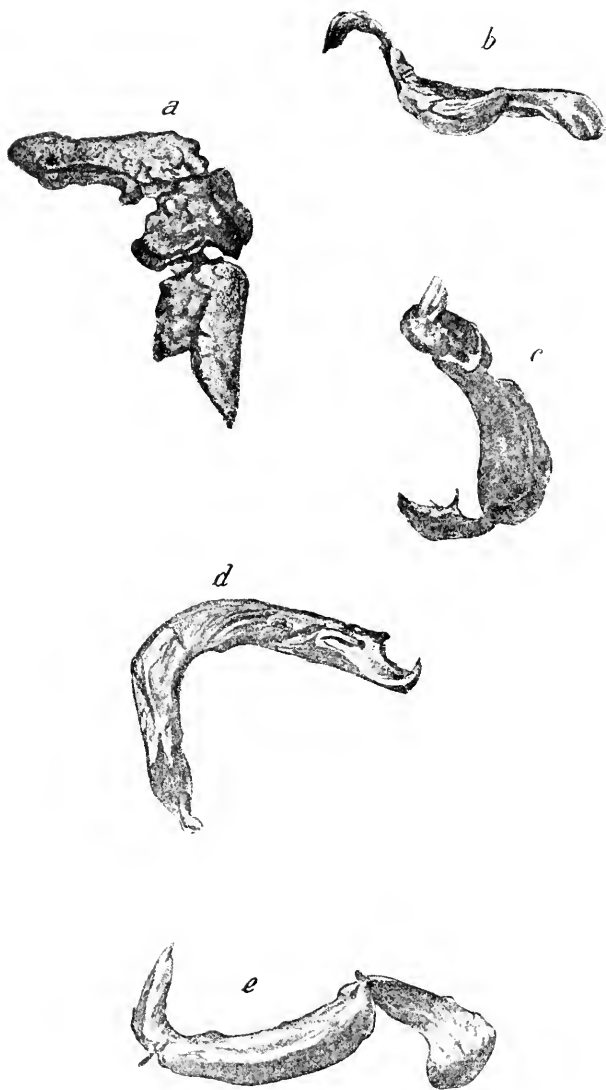


Fig. 2.—*a*. Cholesteatoma and thrombus from the sinus sigmoideus (Jos. Str., 40 years, op. August 1, 1902; healing).

b. Thrombus from the sinus sigmoideus and lateralis (Leop. H., op. December 28, 1903, healing).

c. Thrombus from the sinus sigmoideus, bulbus venal jugularis, and sinus petrosus inferior (Ant. P., op. September 15, 1906; healing).

d. Thrombus from the sinus sigmoideus (Jos. R., op. February 10, 1906; healing).

e. Thrombus from the sinus transversus, sigmoideus and bulbus venal jugularis. (Johann F., 33 years, op. November 30, 1906; healing.) (Case of Politzer's clinic.)

In most cases sudden changes occur in the amount of suppuration from the middle ear in that the secretion either stops, or greatly increases and flows continuously. Further extension of the thrombi, especially to the bulb of the jugular, produces, in consequence of the closure of the deep veins, great distention of the superficial cervical veins with accompanying pressure pains, and restriction of the active and passive movement of the head and neck. In the majority of cases the fundus oculi is unchanged or only its veins are distended and tortuous. On the other hand, in cases of sinus phlebitis or pyæmia, choked disk is a sign of incipient or already developed meningitis. In severe cases occur frequent chills, great temperature variations (several times a



Fig. 3.—Thrombus from the bulbus venæ jugularis and the upper part of the vena jugularis interna (A. Sch., op. July 30, 1906; healing). (Observations at the clinic of Politzer.)

day), and the patient lends the impression of serious illness, lies in a passive dorsal position, shows a jaundiced color, movement of the alae nasi in breathing, dry tongue, feeling of fear, outbreak of sweat. In other cases the general condition is good.

In all cases and in every stage of the disease the diagnosis is not difficult to make; we must, however, not allow the apparent good condition of the patient and the lack of general symptoms to prevent us making an early diagnosis of sinus thrombosis as, indeed, quite frequently the entire result of the operation depends upon an early diagnosis.

The treatment of otitic sinus thrombosis can be only a surgical one and we must repeat once more that otitic pyæmia is decidedly different from all other forms of pyæmia. What are the objects of surgical treatment?

1. Removal of the focus of infection.
2. To confine the pus to the ear thus preventing the formation of metastasis.
3. The establishment of good drainage.

According to our experience the following mode of operation meets these three requirements: The operation must always begin with the ligation of the jugularis. For this purpose the venad jugularis of the diseased side must be laid bare in the middle cervical third; in case it contains a thrombus it is cut through and the upper end, which is sometimes slit longitudinally, is sutured to the upper angle of the throat wound (jugularis cutaneous fistula). The central end can be ligated if the wall of the vein is unaltered and the vein itself empty; if thrombi are found in it or if the wall of the vessel is altered by inflammation, we also leave open the proximal end of the vein and expose it towards the heart until we come to where the vein is normal. In such cases the laying open of the vein will usually have to be extended to the place where the vena thyroidea comes in; in some cases, however, it will become necessary to follow the vena jugularis farther down by temporary resection of the clavicle.

If the jugularis is not thrombosed it must be doubly ligated and cut between the ligatures. We leave the ligatures long in order that we may, after two to four days, in case it becomes necessary, make a secondary jugularis cutaneous fistula.

The cutaneous fistula of the jugular vein serves for the drainage of the vein and the bulb. In making a secondary jugular fistula usually a slight quantity of blood passes at first which is followed by blood serum and later on by pus (sometimes after a few minutes and other times after hours). By the introduction of damp strips of gauze the peripheral end of the vein is kept open and acts as a drainage tube. If the vein contains thrombi with phlebitis in a high degree and inflammatory thickening

of the vein wall, and if the vein is attached to the neighboring parts by adhesions, it is laid bare as far as the bulb and extirpated, after the operation on the ear is completed.

In these cases the thrombus usually extends into the adjacent veins opening into the jugularis. These are cut through in the extirpation of the jugularis, but in order to prevent retention of infectious material they are not ligated.

The advantage of ligating the jugularis consists in the fact that with the immediate operation on the ear itself (as well as when laying open the sinus) we are not afraid of dislodging particles of the thrombi by the jarring produced by chiselling and there is also no danger of air aspiration in opening the veins and sinuses.

In acute cases we perform antrotomy, whereas in chronic cases we do the radical operation, and, in the latter instance, we expose the sinus. Not only the sinus sigmoidæus but also the sinus petrosi and the bulb of the vena jugularis will have to be laid bare beyond the limits of the diseased area so that the seat of the trouble is easily accessible.

As the sinus phlebitis is almost always connected with pachymeningitis externa and quite frequently also with pachymeningitis interna we must also expose the dura in the neighborhood of the sinuses. If we already have indications of an intradural abscess, the simple incision of the dura will hardly be sufficient and it will be necessary to resect that part of the dura which is the most affected, especially if the inner wall is discolored, covered with fibrin, friable, and ill smelling. In operating, attention must be paid to the fact that the sinuses should not be prematurely opened. Injuring the sinus, especially at the beginning of the exposure, may cause severe bleeding which, though not making the operation impossible, will materially complicate and cause delay.

When the sinus region is sufficiently exposed the sinus

sigmoideus is incised 2mm in length with a scalpel. If there is no hemorrhage the sinus sigmoideus is cut longitudinally and the thrombus is first removed from the peripheral end and then from the central end and the bulb of the vena jugularis. The removal of the thrombus in its entirety is always followed by hemorrhage; however, we may easily control this hemorrhage by raising the patient's head and packing the incision lightly with iodoform gauze. If we have no hemorrhage it shows that the incision was insufficient and must be extended farther. In such cases it will sometimes be necessary to expose and incise the sinus transversus in the peripheral direction beyond the middle, also to open the torcular and sinus sagittalis and in the central direction to entirely open the bulb; the sinus sigmoideus, the bulb jugularis, and the vena jugularis interna must communicate as one channel.

The aspiration of the sinus contents does not furnish a reliable result for with parietal thrombosis fluid blood can be aspirated. In this case after incising the sinus with the scalpel the blood flows with diminished force but sometimes with apparently normal or increased pressure. We then cover the incision with iodoform gauze and after a few minutes frequently find the thrombus lying in the incision. The thrombus is thus loosened by the flow of the blood and brought to the incision in the sinus from whence it can be removed. In all cases it is the first principle that every attainable thrombus must be removed. Only in a few cases must we be satisfied with incision of the sinus and delay finding and removing the thrombus. The favorable results that we have obtained in the last few years must be mostly attributed to the fact of complete removal of the thrombus.

The claim that the ends of the thrombus may be sterile and make a very good obliteration for the sinus and the jugularis, protecting the body from infection, does not

hold good. The method based on this claim, to only partly remove a dark red thrombus or even to leave it entirely *in situ*, is indeed dangerous. I have stated above that exact bacteriological examinations have shown that in most cases the entire thrombus is infected and that in a great many cases also the macroscopical examination of the thrombus, removed by the operation, shows that the suppuration is most advanced at the end of the thrombus; therefore we may say that the suppuration began at the end of the thrombus. At the same time we must remember the anatomical conditions of the thrombus; the pointed ends remain entirely in the lumen of the sinus when we remove only the central or obturating portion of the thrombus, or the said thrombus ends may be forced out by the blood pressure and be followed by a secondary hemorrhage.

The prognosis of otitic pyæmia above all depends upon the resisting power of the patient and the virulence of the micro-organisms. In general we may say that the case must be considered the more severe the greater the temperature variations in a day.

The prognosis after the operation depends practically upon the operation itself. The more completely we remove the diseased veins and the thrombi the better will be the chances of healing. From this we may conclude that all cases of severe pyæmic character, without markedly developed anatomical changes of the sinuses, are more difficult to prognosticate. Decrease of temperature to the normal immediately after the operation is always a bad sign and may be considered as temperature of collapse which is due to the marked lowered vitality of the patient. Such falling of temperature is usually, after the second or third day, followed by renewed elevation of temperature. Cases with gradual defervescence of temperature will furnish the best prognosis, and such cases in which the differences in the highest and lowest temperature variations in a day become less and less.

In favorably progressing cases the temperature should become normal from the fifth to the tenth day. Recurring metastasis will of course produce again the pyæmic phenomena, first of all chill; however, this may repeatedly appear after the operation without any special complications or metastasis. The packing is renewed according to necessity from the 5th to the 8th day and the strips are gradually removed with the utmost care. In doing so we avoid discomfort of the patient, secondary hemorrhage, and secure a good course of the wound healing.

To sum up the chief steps of the operative technique in the treatment of otitic thrombophlebitis—first we ligate the jugularis and then proceed with the operation on the ear (antrotomy or radical operation); after this we treat the diseased sinuses. It is now the question whether this method may be applied for all cases of sinus phlebitis or whether we may choose a less complicated way of operating in cases not so severe. Even a brief report, embracing the consensus of opinion touching this subject, by far exceeds the compass of this contribution.

I will therefore only refer briefly to all the operative methods and compare with the best known methods the method which is practised most successfully at this clinic.

What operative methods are employed for sinus phlebitis? 1. Mastoid operation. 2. Mastoid operation and exposure of sinus. 3. Mastoid operation, exposure and exploration of sinus with the aspirating needle, eventually incision of the sinus and ligation of the jugularis, at this or a later period. 4. Ligation of the jugular vein. 5. Optional ligation of the jugularis before operating on the ear, and mastoid operation with exposure and obliteration of the diseased sinus. 6. Obligatory ligation of the jugularis before operating and then proceed as stated in 5.

Of these methods we must first of all reject that method which prescribes only ligation of the jugularis. We may say that this method of operation could only have been brought about by a complete misunderstanding of Zaufal's

proposal. In the first place the treatment of otitic sinus phlebitis by merely ligating the jugularis is not to be considered since it is only an accessory procedure simultaneous with the removal of the local suppurative focus in the ear. The operative methods 1-3 are altogether insufficient; theoretically they might be possible in mild cases—this, however, we can never foretell and the result may be that we in almost all cases would be under the necessity of making another operation, which in itself is a trauma, severely injuring the patient, and making the prognosis unfavorable on account of prostration.

These methods are also faulty in so far as they make the physician who seldom sees otitic pyæmia believe that he may or rather must wait on the operation. Therefore we shall be too late in operating since purulent meningitis may be the consequence of all otitic endocranial diseases. Only in this way could it happen that for years competent authors considered waiting and “fractional” operations as a good method and never thought to connect the usual unfavorable results with the operative method. Aside from this it must be said that the ligation of the jugular vein alone is not productive of any benefit, but on the other hand, as I have stated above, it can even lead to detrimental results, and therefore the only surgical procedure which remains at our disposal is the obliteration of the jugular vein.

As operative procedures therefore the methods 5 and 6 remain and now the question arises whether the obliteration of the jugular vein is optional or obligatory.

The theoretical possibility that for individual cases the ligation of the jugular vein is superfluous in the beginning indicates, *a priori*, that in these cases the ligation will not become necessary later. In every case in which at the first operation the ligation of the jugular vein is not done, but in which later it is found that it must be performed—in these cases it should have been done at the first operation. If one does not make these

limitations, we must note that the methods 1 to 3 which we wish to dispense with must be considered. A case in which the jugular operation has not been performed at first and it becomes necessary to perform it later proves that the indications were misleading, aside from the final results. Finally we must remember that, especially in questionable, apparently mild cases, ligation of the jugular vein is absolutely without danger, and represents a surgical procedure which can be completed in a few minutes, whereas, on the other hand, in every secondary obliteration of the jugular vein the patient is subjected to the danger of the trauma of a new operation. It is said that obligatory ligation of the jugularis means a chematic method of operative procedure which should be avoided on account of the greatly varying course of the pyæmia.

A distinguishing feature followed until some years ago was the extent of the thrombosis in the ear region. According to this we could dispense with the ligation of the jugularis in all cases where the lower thrombus end could be reached from the sinus sigmoideus. In all other cases where the thrombus was found in the bulb or jugularis it was removed before the operation on the ear or immediately after the operation. However this method gave us no satisfactory results. First of all in a great many cases we were deprived of a great many advantages which the preliminary ligation of the jugularis affords, such as avoiding the danger of crumbling and washing out of the thrombosed particles, and air aspiration. Moreover, in many cases where removal of the jugularis appeared to be superfluous at first it had to be done later. According to these experiences we must emphatically speak for the ligation of the jugularis in all cases of clinical pyæmia. We thereby do not incur any risk of unnecessarily ligating the jugularis, for the cases of established pyæmia, in which the sinuses of the ear region show organized thrombi or connective tissue obliter-

ation, indicate that there was no suppuration of the thrombus, which either healed or broke into the mastoid process after perforation of the sinus; and are to be reckoned amongst otitic pyæmia from the anatomical point of view but not from the clinical standpoint.

The opinions on the indication for the ligation of the jugularis differ in literature. Bergmann, Broca, Dalgren, Knapp, Koerner, Voss, Zaufal, approve of the obligatory ligation of the jugularis. Statistics however furnish results not altogether free of objections for we are not informed of all cases but only of such as were healed, and of cases that have come to autopsy we only know those that furnished especially important findings. This explains why, judging by the statistics in the literature, Hessler approves of the optional ligation of the jugularis, whereas Viereck approves of its obligatory ligation. Recently Macewen and Brieger favor the optional ligation, judging by their own cases. Brieger reported 26 cases at the German otological meeting in 1901. In 10 of these cases the jugularis was ligated, of which 5 cases were healed; and in 16 cases such ligation was not made, out of which 8 were healed. He comes to the conclusion that in ligating the jugularis the healing quotient of 50% cannot be raised.

Kümmel recently reported 12 cases; he favors the optional ligation. In none of the cases did he make the jugular cutaneous fistula. Out of 12 of his cases 4 died—2 of intracranial complications and 2 of metastasis. However in the latter 2 cases the meninges and the brain were no more intact and thus the two patients died of metastasis at a time when the meningitis was not fully developed. Thus the autopsy of all the 4 cases of Kümmel showed endocranial complications which developed from the pyæmia.

I shall report some figures of our own observations which I believe will fully explain the indication and the real value of the vein-ligation. Owing to the great

confidence I enjoyed from my past chief, Hofrat Politzer, I was from the very beginning of my assistantship enabled to occupy myself with the treatment of otitic pyæmia. During the course of 7 years I have made 45 ligations of the jugular vein and may divide my material into two groups. The material up to the year 1903 comprises 13 cases of optional ligation of the jugularis and primary or secondary jugular cutaneous fistula. Of these 13 cases 9 were healed, 4 died—1 of intracranial complications. From these figures we may reckon the value of the jugular cutaneous fistula. Comparing these figures with Kümmel's observations, we see that the mortality does not differ essentially. Kümmel shows a mortality of 33%, whereas I show 31%. Taking into consideration only the cases that died of intracranial complications, I having only 1 out of 4 cases, 25% died of meningitis, whereas with Kümmel it was 50%, and making it exact the autopsy of all his cases showed intracranial extension of the sinus phlebitis to be the cause of death.

In consequence of the better drainage through the jugular cutaneous fistula the danger of meningitis from otitic pyæmia was diminished.

The other group of my cases falls within the period from 1903 to 1907. This comprises 32 cases with obligatory ligation of the vein and jugular cutaneous fistula. Of these cases 25 were healed (78%), 7 died (22%)—2 of intracranial complications, *i. e.*, 29%. These figures teach that by the obligatory ligation of the veins better results in operating were secured, that is to say, 78% against 69% were healed; whereas on the other hand the quotient of the cases that died of meningitis was about the same. Our own material thus shows the justification of ligating the vena jugularis in all cases before the operation is made and thus the mortality of cases that did not die of meningitis has been again diminished. The obligatory ligation of the jugularis has thus

improved the result with respect to metastasis in such a degree that there appears or re-appears no metastasis. The better results of operation also justify the opinion that ligating the jugularis before the operation prevents distribution of the germs of infection. From these figures we may derive the real value of the entire method. We succeeded in reducing the 81% mortality of Leutert's and 42% of Körner's, from a report of 308 cases, to a mortality of 22%; and the 77% mortality of Leutert's and Körner's cases that died of meningitis or purulent encephalitis to 25 and 29% respectively.

Now to conclude. Can we expect for the near future that the mortality shall be still more reduced? This question may be answered by our figures. A further reduction of mortality of otitic pyæmia may be expected from an early diagnosis of metastasis and the possibility of an early surgical treatment. Our increased knowledge will make it possible to have the patients come in time for the operation, that is to say, before thrombosis spreads to all brain sinuses.

We, however, also see from our figures that we are now, notwithstanding our perfected operative method, and by the ligation of the veins, not able to further reduce the mortality of the cases of pyæmia complicated by meningitis. Here the chapter of healing otitic pyæmia as a topic by itself is finished and a question of the most intense interest for modern otitic surgery arises, the healing of otitic meningitis. The surgical healing of purulent meningitis has been repeatedly attempted. Though we are at present, in view of the results obtained to this time, far from a perfect operative technique, yet may we look with hope into the future. The good results in the surgical treatment of purulent meningitis will also mean a good result for the treatment of otitic pyæmia.

REPORT OF THE TRANSACTIONS OF THE NEW YORK OTOLOGICAL SOCIETY.

THOMAS J. HARRIS, M.D., SECRETARY.

MEETING OF MAY 22, 1908. THE PRESIDENT, DR. SHEPPARD,
PRESIDED.

Mr. ARTHUR CHEATLE of London reported a case of **chronic suppuration of the middle ear and mastoiditis which drained into the tonsil of the corresponding side.** The patient was a person of low intellect. There were no signs of labyrinthitis. There was a swelling of the parotid gland on the affected side, and examination of the throat showed a bulging of the left tonsil. There were no rigors. Two days later a facial paralysis developed. The next day Mr. Cheatle operated. An infantile antrum was found and a hole in the anterior meatal wall allowing the finger to pass to the tonsil. A sequestrum was discovered in the region of the semicircular canal. The operation was completed by carrying a grooved director to the tonsil and cutting downward. The patient made a good recovery.

Dr. JANSEN of Berlin said that he had had a similar case following an acute middle-ear suppuration, the result of grippe. The operation showed a peri-sinus abscess, a thrombus of the sinus and the jugular vein, which he had to remove entirely, and an abscess in the mouth, situated in the deepest portion of the tonsil. It was necessary, in order to reach all the disease, to resect a part of the atlas.

Dr. McKERNON reported the case of a boy of 13 upon whom an **ossiculectomy** had been performed five years before. He complained of ear discharge and sore throat. Examina-

tion showed pus coming down on the upper surface of the tonsil on the diseased side. A Stacke operation was done, and a sinus was found from the tympanum to the tonsil which was enucleated.

Dr. HASKIN quoted Dr. Holmes of Boston as reporting recently several cases where a connection between the tonsil and carious bone in the ear existed through the anterior meatal wall.

Dr. DENCH reported a case of **labyrinthitis** secondary to disease of the ear and mastoid. The patient was a man of 60 who had a profuse discharge from the ear for four weeks before the mastoid was opened. This was found broken down. The sinus was exposed and opened. The bacteriological examination showed the streptococcus capsulatus. Four weeks later vertigo, severe vomiting and nystagmus developed. The latter was on the side opposite to the lesion. Temperature of 99°. No optic neuritis. The vertigo soon stopped, but the discharge continued. The radical operation was performed. A fistula was discovered in the horizontal semicircular canal. A curette in the region of the oval window brought away a part of the promontory. The patient recovered.

Discussion.—Dr. JANSEN said that he had seen a similar case which had followed the grippe. Nothing was seen at the time of operation in the oval window or in the semicircular canals. There were no labyrinthine symptoms. Four days later severe nystagmus toward the opposite side developed, with vertigo. There was no fever and no headache. Two days later the nystagmus became better, but headache and fever set in. He then opened the labyrinth, which was found to contain blood. The symptoms improved for a time, but a lumbar puncture showed a serous meningitis, and the patient died. Jansen thought that this proved that it was very important to operate at once when severe labyrinthine symptoms appear, especially where an exudative process is present in the middle ear.

Dr. GRUENING said that he had operated upon 61 cases during the past winter, of whom 3 showed labyrinthine symptoms. All recovered by simple cleaning out of the antrum. He does not approve of opening the labyrinth when

labyrinthine symptoms are present in suppurative disease of the antrum.

Dr. JANSEN thought that too great emphasis could not be placed upon the prevention of fatal meningitis following disease of the labyrinth, through early operation. Many cases will not show pus in the labyrinth. To show the necessity of prompt action, he quoted two cases which he had seen.

The first case developed labyrinth symptoms four days after an acute suppuration of the middle ear. He saw the case at 10 o'clock in the evening. At that time there was no fever. Next day the temperature was 103° . He operated on the labyrinth. For a day and a half the labyrinthine symptoms were better, then the patient became worse and died. If he had operated when he first saw the case, he would have saved him.

The second case was ill three days when he saw him. For only half a day he had labyrinth symptoms. Operation the same day revealed a fistula in the external semicircular canal, a bad sign in chronic cases; death in 36 hours.

Mr. CHEATLE was of the opinion that there was a certain over-enthusiasm in operating upon the labyrinth. His feeling was that in doing the radical operation, if no disease was apparent upon the inner wall, we should do as thorough an operation as possible and then wait. Many times the labyrinth symptoms will disappear of themselves.

Dr. GRUENING said that, even where he found caries of the external horizontal canal, he performed the radical operation and his cases get well.

Dr. JANSEN said in reply that we must recognize two forms of acute labyrinthitis (*a*) circumscribed, (*b*) diffuse. The fistula in the case of Dr. Dench was due to the labyrinthitis, and represented the second form. The fistula in Dr. Gruening's case was secondary, due to cholesteatoma, and belonged to the circumscribed variety. The majority of the diffuse cases die. The circumscribed variety does not affect the meninges. The latter is one of irritability, the other that of paralysis. The heat and cold test will give the differential diagnosis. He urged that we should follow the rule and not the exception. The fatal cases are always complicated by diffuse meningitis.

Dr. PHILLIPS made a further report of the case of **carcinoma of the ear** which he presented at the January meeting, to the effect that radium had been used but with no effect except to greatly increase the pain. He also reported the case of a child of six months who had facial paralysis and an enormous cervical glandular swelling with discharging ear for four months. There were no mastoid symptoms. The glandular condition appeared tubercular. On operation the entire mastoid and petrosal portion of the temporal bone was found to be broken down and converted into an immense cavity with extension to the lateral sinus and exposure of the dura. The operation reduced the glandular swelling one third. Ten days later meningitis developed and then there was no question that the child would die.

Dr. HOPKINS reported a case of mastoiditis with anomalous course of the facial nerve, discovered at the time of the operation. When curetting the tip of the mastoid, a pinkish cord was seen coming out of just within the extreme tip of the mastoid, quite external to the digastric fossa. Further examination showed that the nerve had an oblique course. A slight paralysis resulted. As far as he knew, this was the first case to be met with on the operation table, though Berens had described a similar anomaly found in an anatomical specimen.

Dr. GRUENING reported a case of **mastoiditis with sinus and vein thrombosis and numerous metastatic abscesses**, the result of a profound streptococcus infection, where recovery took place after repeated operations. The case was that of a boy, 2 weeks ill with chills, temperature of 107.4° , and acute suppuration of both ears. There was tenderness in the neck over the course of the jugular. There was a drop of twelve degrees in the temperature. Streptococci were found in the blood. Gruening opened the sinus and the vein on the one side, which he tied, and did a simple mastoid operation on the other. Streptococci still continued in the blood. An abscess developed in the thigh, followed by abscesses in the arms and perineum, all of which were opened. For the first time after the last operation, the temperature fell and the streptococci disappeared from the blood. The boy was discharged seven weeks afterward, cured. Dr. Gruening added

that all the coats of the vein were thickened down to the clavicle, and the walls diseased to that extent but not beyond.

Dr. JANSEN spoke of a case of **carcinoma of the labyrinth**. At the time of the operation the labyrinth was not opened on account of the condition of the patient. The diseased glands of the neck were removed and a suspicious appearance found in the region of the oval window. The post mortem confirmed his diagnosis.

A second case, where the character of the granulations in the ear led him to make a clinical diagnosis of carcinoma, was not operated upon because the microscopic report did not confirm this diagnosis. Some months later a large carcinoma developed. The case made him feel that we should not depend upon the microscopic findings but upon our clinical picture.

Dr. HASKIN referred to three cases of carcinoma where the pathologic examination was negative.

Dr. WHITING said that he had seen three cases of carcinoma of the middle ear. One case showed an apparently simple polyp in the ear. There was, however, an unusual degree of pain complained of. The polyp was removed, but was rapidly replaced by granulations, which grew to enormous size. At the patient's earnest request, these were removed after first tying off the common carotid. In spite of this the hemorrhage was so severe as to demand the use of the Paquelin cautery. Ten days later he died.

Dr. WHITING had seen two cases where the auricle alone was involved. X-ray in his hands did no good. He had got the best results from the use of Labarraque's solution and calomel.

Dr. LUTZ said that he had seen almost an identical condition in a case of sarcoma of the spindle-cell variety. This began also as a polyp. There was intense pain. Three operations were performed, with rapid return of the growth.

Dr. BACON reported a case of double mastoiditis with unusual symptoms. The patient was a boy who had suffered from double otitis media on both sides, for which he had opened the drums. The boy did well for a week although he kept him in bed and the ear continued to discharge. Suddenly the eyelids began to swell and acute nephritis developed, with

three per cent. of albumen. It was a question whether a mild scarlet fever or the grippe was the cause. The ear still continued to improve till five days ago, when he had a chill, with tenderness over each mastoid. There was also a high leucocytosis. At the onset of the sickness he had mastoid symptoms, but these had quickly subsided. The next day he operated and found a diploic mastoid on both sides. On account of the chill, Bacon opened the sinus on the most affected side and found a poor return of blood. The curette was introduced towards the bulb, when a free flow of blood was established. The temperature fell to normal, but for a day or so the albumen increased to 10%. Nothing was found in the blood.

Dr. BRYANT related the history of a case of **meningeal hernia**. A patient had had five operations upon the ears for double mastoiditis. When he saw the case there was what appeared to be an aural polyp in one of the canals. The radical operation was done, and revealed that the polyp was in reality a meningeal hernia, in front of which there was a fistula opening into a small cerebral abscess of the temporo-sphenoidal lobe. A second operation was performed to increase the drainage through incision of the dura. All went well till a nurse cut the bandage, allowing a cerebral hernia to protrude. This could not be reduced, and gradually increased to the size of an egg. It was cut off, causing profuse flow of cerebro-spinal fluid, which finally ceased and the wound healed completely.

REPORT OF THE TRANSACTIONS OF THE CHICAGO LARYNGOLOGICAL AND OTO- LOGICAL SOCIETY.

BY DR. GEORGE E. SHAMBAUGH, SECRETARY.

MEETING OF MARCH 10, 1908. PRESIDENT A. H. ANDREWS
OCCUPIED THE CHAIR.

Dr. Jos. BECK presented a child who had suffered from a **laryngeal obstruction** since birth. A soft yielding tumor was found in the region of the epiglottis by palpation. Laryngoscopic examination was impossible. Tracheotomy was performed to relieve the respiratory symptoms. Upon incision a grayish gelatinous substance was evacuated from the tumor.

Dr. Beck presented a patient where the typical symptoms of **sinus thrombosis** had been found, where the leucocyte count reached 40,000, and the jugular vein was found thrombosed down as far as the thyroid cartilage. After cleaning out the lateral sinus, and operating upon the jugular vein the bulb of the jugular was laid open according to the Alexander method. The result was entirely satisfactory.

In discussing Dr. BECK's case of thrombosis Dr. SHAMBAUGH stated that these cases of jugular bulb involvement present one of the most difficult problems in connection with aural surgery. In the first place, it is not always an easy matter to determine in just what cases we are justified in operating upon the bulb of the jugular, and in the second place, the operation itself is a difficult and in some respects a serious one. The anatomical variations in the size of the jugular bulb are so marked that, whereas the cleaning out of the bulb may be a very simple matter in some cases, in others

a complete laying open of the jugular bulb may be an operation so extensive as to engender not only the facial nerve but the posterior semicircular canal. For this reason we should be very careful that we do not undertake the cleaning out of the jugular bulb unnecessarily. Not every case where the jugular bulb is found thrombosed requires a laying open of the bulb before recovery can take place. If the thrombus is not infected the patient is better off with the thrombus in place. The difficulty, of course, is in determining in what cases the thrombus is infected, and in what cases it is not infected. If at the time of the operation upon the lateral sinus a broken down foul-smelling discharge comes from the region of the bulb, then we should proceed at once with the operation of laying open the jugular bulb. If, on the other hand, there is a firm thrombus in the bulb with no appearances of infection, he believes that the logical treatment, in view of the serious nature of the operation upon the bulb, is to treat the case as though it were a non-infected thrombus. In case subsequent symptoms indicate that the thrombus in the bulb is an infected one, under these circumstances we are justified again in cleaning out the jugular bulb. The operation that seems to make it possible always to reach the bulb and effect its exposure is that of chiselling away the portion of the temporal bone lying along the anterior margin of the extension of the lateral sinus forward toward the bulb. The two dangers in this operation are, that of injuring the posterior semicircular canal in case the chiselling is carried too high up along the posterior surface of the petrous portion of the temporal bone, and in the second place, that of cutting off the facial nerve in case too thick a piece of bone is taken off in front of the sinus.

Dr. FRANK ALLPORT believes that if a thrombus is found extending backwards toward the torcula, it is usually a non-infected thrombus, and for this reason can be left alone. If the thrombus extends forward in the course of the circulation of the lateral sinus it is more likely to be infected, and for this reason it should invariably be removed if possible. He is not in favor of the radical exposure of the bulb of the jugular, but believes that after exposure of the jugular vein the condition in the bulb can be sufficiently relieved by

extending a long narrow curette high up in the jugular vein toward the bulb.

Dr. A. H. ANDREWS doubts the necessity, in most of the cases of involvement of the jugular bulb, of the radical exposure of this region. He recalls a number of cases where, after cleaning out the lateral sinus and the ligation of the jugular vein the patient made a good recovery without molesting the condition of the jugular bulb.

Dr. NORVAL H. PIERCE has operated upon a number of cases of thrombosis of the jugular bulb. He considers the exposure of the jugular bulb in cases where this is thrombosed as the logical surgical procedure, and believes the patient is better off with the bulb thoroughly cleaned out than with a thrombus allowed to remain. He recalls a case where the fourth day after operation upon the sinus the patient succumbed to a thrombus extending to the cavernous sinus which he believes was due to an extension from the thrombus in the region of the bulb. He thinks the difficulties of the operation vary with the case, and that in the majority of cases a thorough drainage can be accomplished without much risk to the patient. While the Alexander method of exposing the sinus is perhaps the easier and safer method, he thinks the Grunert method is the best.

Dr. BECK said he did not believe in leaving an infected area anywhere in the field of operation, especially when it can be reached. An attempt should be made at least to remove it. In cleaning out the sinus free bleeding should be obtained behind as well as below, then only you may be sure that the thrombus has been removed. While the drainage and puncture of the bulb of the jugular can sometimes be accomplished through the floor of the tympanum, he does not believe this is a method that can be advised as a routine one.

Dr. OTTO T. FREER presented a patient with **tabic laryngeal crises** and paresis of the abductors of the vocal cords, also due to tabes. His report was supplemented by Dr. STANTON R. FRIEDBERG, who had observed the patient in his service at Cook County Hospital. The attacks of crises varied in frequency from several times a day to once in a few days, and were usually introduced by an aura consisting of ab-

normal sensations and tickling in the throat. The aura was followed by spasmodic closure of the glottis and a suffocative spell which completely shut off the patient's breath and voice for a period of from $\frac{1}{2}$ to $\frac{3}{4}$ of a minute. The spasm of the glottis then relaxed enough to permit labored breathing with stridor, the onset terminating in a coughing spell. Physical examination by the neurologist, Dr. William Healy, showed enough of the signs of tabes to prove its existence beyond doubt, inco-ordination of both upper and lower extremities, Argyll-Robertson pupil, Romberg's symptom, and other positive signs being present.

Laryngeal inspection showed permanent partial adduction of the cords, which did not move outward even during deep inspiration. During quiet breathing they remained abnormally approximated. These conditions were regarded as due to paralysis of the crico-arytænoidei postici muscles.

Dr. Freer, in his comments referred to Sir Felix Semon's classic section on nervous diseases of the larynx in Heymann's *Handbuch der Laryngology* and the great influence it had had in stimulating research in the neurology of the larynx. He regretted that no English version of this superb work of Semon existed. The history of the patient was compared with Semon's description of the crises of tabes and found to be in accord with it, including the paralytic state of the abductors of the cords mentioned by Semon as frequent accompaniments of tabic laryngeal crises.

Dr. Freer referred to the prevailing impression, gained from the brief articles of text-books, that paralysis of the crico-arytænoideus posticus muscle is immediately followed by permanent adduction of the cord to the median line—that is, the centre of the glottis. He explained that this impression is incorrect and that the only evidence of posticus paralysis, especially in tabes, for a long time may be a slowly developing loss of the faculty of abduction of the cord into the inspiratory position, coinciding with the gradual loss of power of the abductor muscle to complete paralysis. Only later, as spastic contracture of the unantagonized abductors develops, is the cord gradually drawn towards the median line, which may never be reached by it, in so slowly progressing an affection as tabes, before the patient dies.

Semon's law, that in gradually progressing paralysis of the recurrent laryngeal nerve, whether of nuclear or peripheral origin, the abductor muscle, the crico-arytænoideus posticus, becomes powerless before the adductors of the cord succumb, was mentioned by Dr. Freer as so completely sustained by long observation that it may be regarded, as Kuttner states, as axiomatic, for all attempts to disprove it in the past twenty-five years have failed.

Remarkable features in the case presented were the occurrence of pain in the larynx and also in the region of the heart during the spells and the occurrence of a period of gastric crises with vomiting which preceded the laryngeal ones, the gastric crises ceasing before the laryngeal ones appeared.

Dr. Friedberg, examining the patient laryngoscopically during a crisis found spasmodic adduction of the cords.

In discussing this case Dr. HEALY said the case illustrates that tabes is not only a sensory disease but partakes also of motor qualities. This was the first well-marked case of laryngeal crises that he had seen in a study of some two hundred cases. Of the two hundred and seventy cases recorded in medical literature 40% presented laryngeal crises. Some observers had seen as high as 10% of the cases of tabes presenting symptoms of laryngeal crises, while others had seen but 2%.

The frequency of paralysis of intrinsic muscles of the larynx varies from 14% to 26%. The abductors are nearly always affected first. This condition may appear very early as preataxic.

Semon saw a case in which for two years it was the only symptom of tabes. It may not appear until the last stage, and then in connection with gastric crises.

Oppenheim found that pressing on the sides of the hyoid bone frequently brought on an attack of laryngeal crises in a patient who is subject to it. Most authorities maintain that practically always the nucleus ambiguus is affected. Others, however, found the lesion in the root fibres running up through the medulla or in the vagus itself. The prognosis of this symptom is very bad; it may necessitate an operation.

Semon points out, however, that as time goes on paralysis of the adductors takes place, and the patient is then relieved

of all further trouble. He also points out that an operation in such cases is rather dangerous on account of the trophic disturbances which frequently take place in tabes, and he has seen sloughing and failure of the wound to heal after tracheotomy. The treatment usually recommended is painting the larynx with a strong solution of cocain, and giving bromides and codein internally.

Dr. HOLINGER remarked that some authorities claim that the treatment of syphilis is responsible for tabes. He asked whether there was a history of syphilis in this case, and what treatment, if any, had been carried out. Dr. FREER replied that there was no history of syphilis, and a careful examination failed to reveal any evidence of this disease. He pointed out that the laryngologists may be called upon to discover nervous diseases through evidences in the larynx, and called attention to the important work on the innervation of the larynx that had been done by the German investigators.

Dr. H. KAHN read a paper on the **subjective sensations of smell and their significance**. He presented the views of the various rhinologists who had written on this subject, and discussed the various theories causing subjective sensations of smell. He concluded his paper by reporting a number of cases that had come under his observation, and where, in spite of the absence of any other symptoms of nasal diseases, he had found upon puncturing the antrum a chronic latent empyema with a secretion having the same character of odor as that from which the patient complained.

Dr. BALLENGER raised the question whether these cases where an organic basis for the subjective sensations of smell is found, such as chronic empyema of the antrum, should be classified as a case of parosmia.

Dr. HOLINGER called attention to the fact that not all cases of parosmia have an organic basis. It is not an unusual symptom of coryza. If in such cases the sinuses were carefully examined, possibly the cause for the parosmia in these cases could be discovered.

Dr. HEALY said that since the work of Jackson on the uncinate gyrus the neurologists had paid more or less attention to the sensation of smell. An important point is its relation to epilepsy. There has been described a class of

fits, so-called uncinate fits, in which the aura has been that of subjective sensations of smell. It is believed now that many of the so-called hysterical symptoms of parosmia may be due to the irritation of the uncinate gyrus. One of his patients (a hysteric young girl) believes she has an odor emanating from the body. She has ideas of persecution, which make up a nice picture of paranoia. She has been given careful treatment, and it seems possible that there may be some organic disease, such as Dr. Kahn had found in his case, since she had not been relieved by other treatment.

Dr. KAHN said he had given only a clinical classification in his paper. These are subjective symptoms, and in case an objective cause is found it becomes an objective symptom. A classification of true and pseudo-parosmia could be made, the true parosmia being purely of nervous origin with no definite organic change. As far as the accessory sinuses are concerned, it is pretty well known that parosmia is found only in diseases of the ethmoidal sinuses and in diseases of the antrum, the sphenoidal and frontal sinus not causing this symptom.

Dr. STUBBS presented a **perfected Gottstein curette**, and described in detail the technique of the removal of adenoids by means of such a curette. The cutting should be in a horizontal plane from before backwards, and when one reaches the posterior wall of the pharynx the curette should be so tilted and brought forward as not to scrape the posterior wall of the pharynx. The knife of the curette is so placed that it will cut in a horizontal plane when carefully introduced.

Dr. Stubbs states that the pharyngeal tonsil has a definite limited location, and that it does not comprise the lymphoid tissue which is found in other parts of the naso-pharynx—for instance, in the fossa Rosenmueller. A proper-sized curette, if manipulated properly, will remove in one incision the pharyngeal tonsil in its entirety.

Dr. PYNCHON, in discussing the curette presented by Dr. Stubbs, stated that he endorses the angle of the cutting blade. It is the only one that will curette the entire wall. His only criticism was that the blade was in a straight line. The pharyngeal vault is high arched, and cutting a straight line across it does not enable us to touch all of the surface. The

blade should also be rounded. He has a curette which is curved and has side-cutting blades, so that the fossa of Rosenmueller can be curetted.

Dr. BALLENGER called attention to the anatomic variations in the formation of the pharyngeal vault, and to the fact that not many curettes will meet all these conditions and still remove the adenoid tissue. He thinks Dr. Stubbs's curette is one of the best. He thinks the curette designed by Dr. Pyncheon, with a backward sweep of the blade, would be successful where Dr. Stubbs's would fail.

Dr. GRADLE thinks the curette is correctly designed, and that it is applicable to the slight variations of the pharynx met with in practice, and that with moderate skill and some practice the mass can be brought out in one piece with one sweep. It presupposes, however, some practice and skill. For this reason Dr. Gradle has designed the automatic guillotine or curette. It is similar in curve and form to Dr. Stubbs's curette. The knife of the guillotine does break once in a while but only in one place. All that is necessary, however, is to put in a new knife. The particular advantage of the guillotine is that it adapts itself automatically to the shape of the pharynx, and if the operator remembers to push it upwards firm enough he cannot fail to bring out the mass even with very little skill. With the exercise of more skill he believes Dr. Stubbs's curette will accomplish the same purpose as thoroughly and as satisfactorily.

Dr. JOSEPH BECK stated that he had used the curette devised by Dr. Barnhill, and had experienced no trouble in getting out the adenoids in one mass. He thought one might have trouble with Dr. Stubbs's curette in cases where there is a deformity of the wall of the pharynx, as a protrusion of the atlas. Extreme care would have to be used in making the forward and upward sweep, the last step in removing the curette, so as not to cut the mucous membrane. The greatest trouble the average practitioner has is in making the sweep downwards. He has modified Dr. Gradle's guillotine by making the blade work upwards, thus preventing the possibility of breakage. He uses a solid blade devised by Laforce, and it does the work very nicely.

Dr. STUBBS (in closing) states that he had made the knife

of his curette straight instead of curved purposely after making a careful study of the pharynx on the cadaver. He does not claim that his curette will fit every case, but he does believe that the vast majority of cases are suitable for his curette. The particular thing is to get the adenoid mass out in one piece. The supporting pillars in the curette devised by Dr. Barnhill do not resist as much, and prevent coming in flush with the upper angle, preventing satisfactory removal of the adenoids. He has also flattened his knife more than is done in Dr. Barnhill's curette, and also made the knife straight in front.

MEETING HELD APRIL 14, 1908. PRESIDENT A. H. ANDREWS
IN THE CHAIR.

Dr. JOHN EDWIN RHODES exhibited a patient suffering from an unusual condition of **xanthoma** occurring in a boy twenty-three years of age. The lesions were widely distributed over the body, particularly the genitalia, chest, shoulders, eyelids, and in throat and larynx. Respiration was interfered with to such an extent that a tracheotomy had to be done about two years ago. Improvement followed immediately, and the patient is now able to speak well and the nodules elsewhere are gradually lessening in size.

Dr. GEO. E. SHAMBAUGH exhibited a case of **tubercular laryngitis** in a man fifty years of age. Symptoms of hoarseness began about a year ago, and at no time until within a few weeks has he suffered from any other symptoms. Recently there has been some slight pain on swallowing. No evidences of tuberculosis were found in any other part of the body. The condition was one involving only the right side of the larynx. There was extensive nodular infiltration with ulcerations occupying the false cord and extending to the arytenoid cartilage on the right side only. There was very little reaction about the lesion, such as œdema and redness. The vocal cord is freely movable and is apparently not involved. The microscopic sections made from tissue removed from his throat were exhibited, showing typical tuberculous infiltration with numerous giant cells.

Dr. NORVAL H. PIERCE reported a case of chronic suppurative otitis media with **thrombosis** of the **lateral sinus** and

jugular bulb, erosion of facial canal, and cerebellar abscess on which he had operated, the patient recovering. The case was a man, thirty years of age, who had suppurative otitis media for two years. He came complaining of pain about the right ear and vertigo of ten days' duration. Shortly after the onset of vertigo he had frequently repeated chills, with temperature ranging from normal to 105° F. and at this time the facial nerve became involved. The dizziness increased so the patient was unable to lift his head. The nystagmus was very marked on turning the eyes to the opposite side. The membrana tympani showed a small perforation with a foul smelling discharge. The radical operation was performed for the exenteration of the mastoid and tympanum. The antrum was found filled with pus and cholesteatoma. The head of the malleus was necrotic. The critical condition of the patient prevented any further exploration at this time. Subsequently the patient was again anæsthetized, the lateral sinus was cleaned out, and the jugular vein and bulb were resected, and a cerebellar abscess drained. Patient has made a good recovery.

In discussing this case Dr. BECK pointed out two interesting features of the case: first, the presence of a cerebellar abscess without marked symptoms, and second, the occurrence of the chills and temperature curve. He had recently operated upon a case where a diagnosis of labyrinthine disease had been made from the symptoms of nystagmus and staggering gait. On opening the labyrinth it had been found unaffected, but there was found an abscess about the lateral sinus which caused compression of the cerebellum. When this was relieved the symptoms disappeared. He inquires whether the symptoms of nystagmus in Dr. Pierce's case might not be explained on the basis of the cerebellar abscess. He lays great stress on the occurrence of a chill in suppurative ear disease as indicative of sinus trouble. He has operated recently on several cases with gas oxygen anæsthesia, to his entire satisfaction. He claims there is no danger of collapse or prostration, which occurred in this case under another anæsthetic. He inquired of Dr. Pierce whether the facial paralysis cleared up.

Dr. FRANK ALLPORT considers the occurrence of laby-

rinthine involvement as an indication that there will probably be intracranial involvement as well. In cases where the diagnosis is doubtful he finds considerable assistance in making a blood examination, both the bacteriological examination and a careful examination of the leucocyte-count. He believes that in such cases one should always aim in making a full exposure of the sinus. He does not think it possible in all cases to make a positive diagnosis before operating. He mentioned a case he had seen recently where the symptoms had been slight, and yet he had been led to operate upon both mastoids and in both there was serious involvement, and later the sinus was found to be involved. The symptoms are not always clear cut and well defined.

Dr. GEO. E. SHAMBAUGH called attention to the fact that the nystagmus and ataxia which occur in cases of cerebellar abscess are not unlike the same symptoms arising from a pus infection in the labyrinth. The cerebellar abscess of otic origin arises usually from an extension through an involved lateral sinus, or by way of the labyrinth. If the cerebellar abscess follows secondarily upon suppuration of the internal ear, one may be able to diagnose the occurrence of a cerebellar abscess by finding a complete destruction of hearing and an absence of increase in nystagmus and vertigo by the Barany method of syringing the external canal with hot and cold water.

Dr. PIERCE (in closing) states that the nystagmus disappeared after the operation, and the facial paralysis has also largely disappeared. As his experience increases he has come more and more to attach less importance to the value of the blood count. In positive cases we do not have to make it, and in the doubtful cases it is too uncertain to be relied upon.

Dr. GRADLE exhibited a specimen of **calculus** removed from the **duct** of the **submaxillary gland**. He also reported four cases of periauricular abscess and furunculosis of the canal, in which the symptoms very closely simulated those of a mastoid abscess. He called attention to a number of points in the differential diagnosis and concludes that the periauricular abscess has not received as much attention as its importance deserves.

Dr. HOLINGER thinks the differential diagnosis is not always easy even for the experienced ear surgeon.

Dr. PIERCE was inclined to believe that the differential diagnosis between the two conditions was not such a difficult matter, and that it could be based usually upon the character of the infiltration. In furunculosis and periauricular abscess from other causes than mastoiditis, he believes the presence of œdema and pitting will always be found, whereas, if the condition is one of mastoiditis, these symptoms are largely absent in spite of the infiltration over the mastoid.

Dr. FREER referred to a case in his experience where periauricular swelling was due to a closure of Steno's duct. The case had been diagnosed as one of necrotic bone, but upon removal of a fish bone from the duct the symptoms subsided.

Dr. ALLPORT was inclined to agree with Dr. Pierce in thinking the differential diagnosis is usually an easy question, yet in the atypical cases any surgeon will often be puzzled.

Dr. BECK recommends the X-ray in determining the condition of the mastoid, and thinks its use will soon become universal.

Dr. ANDREWS finds the transilluminator a valuable aid in these conditions. In mastoid abscess the light is obscured, while in periauricular abscess the passage of light is not interfered with, at least until there is external evidence of pus.

Dr. GRADLE (in closing) said that the point made by Dr. Pierce in the differential diagnosis applies to many cases, but what he wished to point out in reporting these cases was that there are exceptions that are very puzzling for the time being, especially when there is no swelling with existing pain and tenderness. In one of the cases he reported he would have preferred to operate, but the patient was unwilling.

Dr. FRANK BRAWLEY reported a case of **headache** which he believed to be due to **non-suppurative frontal sinusitis**. He referred to two previous papers upon the same subject which he had published. The present case was, he thought, an exceptional one. He believes this condition may occur in an apparently normal nose and may be due to closure of the naso-frontal duct by turgescence of the middle turbinated body, which occurs during damp, cold weather, with head

colds, and during the menstrual period, etc. The pain is caused by irritation of the fibres of the anterior nasal nerves in the frontal sinus, due to the swelling of the lining membrane of the sinus. This swelling results from the vacuum formed in the sinus by the absorption of the oxygen from the imprisoned air. The treatment is resection of the anterior third of the middle turbinated body. In the present case this did not suffice, and the naso-frontal duct was cauterized with trichloroacetic acid and chromic acid, which destroyed part of the oedematous lining membrane, and caused the remainder to adhere closely to the bony canal by adhesive inflammation. The symptoms have been entirely relieved.

Dr. PIERCE questioned the advisability of cauterizing the naso-frontal duct, fearing the ultimate result of the cauterization would be to lessen the lumen of the duct by cicatricial contraction.

Dr. BRAWLEY (in closing) replied that there is no danger of cicatricial closure, as cauterization makes the soft tissue adhere more closely to the bony walls, thereby increasing the lumen, and pointed out the use of caustics in the dilation of the lachrymal duct.

Dr. L. N. GROSVENOR reported a case of **chondroma** and **osteoma** in the faucial tonsils. The condition occurred in a woman twenty-seven years of age where there was an apparent stiffening from ossification of the soft palate, so there was a marked speech defect. The finding of cartilage and bone in the tonsils has been reported a number of times, the writers usually referring the condition to an elongation of the tip of the styloid process. Others writing on the subject have attributed the finding of osseous tissue in the tonsil as due to metaplastic changes. Others conclude that the abnormal growth of cartilaginous structure in the tonsils occurs from a remnant of the second branchial arch. In drawing conclusions from the study of his case Dr. Grosvenor believes the cartilage and bone are not part of the styloid process, for he was unable to palpate the stump. Again, the condition occurred in the form of a ring or triangle rather than in a single nodule. He does not believe the condition is one of metaplastic changes, for there was no clinical history or pathological finding that would justify such a claim. He believes the

logical conclusion is that the cartilage and bone found in these tonsils was developed from a matrix of unused or displaced embryonic cells derived from the second branchial arch.

Dr. GROSVENOR exhibited a series of sections of the tonsils, which were thrown on the screen by means of a lantern.

Dr. HOLINGER exhibited a series of sections of pathological conditions of the labyrinth.

Dr. BOOT exhibited sections showing the development of the nasal cavities in a human embryo.

Dr. FREER exhibited sections of primary tuberculosis of the nose.

Dr. OSTROM exhibited sections of sarcoma of the faucial tonsil.

Dr. SHAMBAUGH exhibited sections of the normal organ of Corti and of the crista ampullaris.

MEETING OF MAY 12, 1908. THE PRESIDENT, DOCTOR A.

H. ANDREWS, PRESIDED.

Maxillary cysts of dental origin with report of a case. By Dr. NORVAL H. PIERCE.

Dr. Pierce presented drawings showing a large maxillary cyst, which he had removed intact. The cyst contained clear fluid, and had its origin from the root of a molar tooth. Dr. Pierce discussed in detail the differential diagnosis between maxillary cyst of dental origin and disease of the maxillary sinus.

Dr. JOSEPH C. BECK reported a case of **dentigerous cyst** of the follicular type. The patient had presented symptoms of antrum trouble for several months. No evidence of nasal trouble. There was extreme tenderness over the antrum and alveolar process. Two teeth were missing. A radiograph showed the teeth misplaced in the jaw. The opening into the cyst was made over the swelling in the roof of the mouth. The cavity of the cyst was filled with grumous fluid. The teeth were removed, and the cavity packed, but it did not heal. Later the walls of the cavity were scraped and were lined with a flap taken from the gum. This resulted finally in healing. The patient has had no trouble since, and wears a plate to supply the missing teeth.

Dr. Beck also called attention to a method of obliteration of the antral cavity in empyema by means of the injection of bismuth paraffin paste as advocated by Dr. Emil Beck.

Dr. GEORGE E. SHAMBAUGH emphasized the significance of the bulging of the external wall of the antrum in cases of maxillary cyst. The older writers on disease of the maxillary sinus refer to an ectasia of the facial wall as one of the characteristic signs of empyema of this sinus. It became known later that cases presenting such an ectasia were not cases of true empyema, because on puncture a clear fluid was found. These cases were still considered as cases of antrum disease, and were referred to in the literature as cases of "hydrops antri." We now know that the so-called cases of hydrops antri were invariably cases of maxillary or dental cysts, which had developed at the expense of the cavity of the antrum, and produced as well a bulging of the facial wall of the antrum. Disease of the maxillary sinus does not produce a bulging of the facial wall. The most characteristic symptom of maxillary cyst is ectasia of the facial wall of the antrum.

Dr. J. HOLINGER said he differed with the statement made by Dr. Shambaugh that disease of the maxillary sinus does not produce bulging of the facial wall. Only the day before he had operated on a patient who had a distinct bulging of the facial wall of the antrum, and on opening the maxillary sinus he found a tumor. It proved to be a case of simple granuloma. The patient stated that her face had been swollen as long as she could remember, but she had not experienced any annoyance. A photograph made forty years before showed this swelling. He called the attention of the Society to a boy he had shown several years ago in whom there was an abscess of the septum of the nose, and where a misplaced tooth appeared later to be the cause of the trouble. The ulceration of the septum was so extensive in this case, that as the child develops there has begun to appear a depression of the bridge of the nose. There is now a membranous septum, but no cartilage.

Dr. SHAMBAUGH replied that he did not intend to give the impression that in all cases where there is a bulging of the interior wall of the maxillary sinus a dental cyst would be

found. What he meant to say was that no case of empyema of the maxillary sinus was known to produce ectasia of the interior wall. Of course such an ectasia may be caused by a tumor of the maxillary sinus.

Dr. NORVAL H. PIERCE (in closing the discussion) emphasized the fact that dilatation of the antrum is one of the usual symptoms of tumor of the sinus, and that a swelling of the face over the antrum in empyema of this cavity may take place when an osteomyelitis is set up, but this is not in the nature of a true ectasia. In such a disease of the maxillary sinus the symptoms are so distinctive that the possibility of confusing this condition with that of a dental cyst is hardly possible.

Non-suppurative labyrinthine disease occurring in the course of mumps. By Dr. G. W. Boot.

Dr. Boot had made a study of the literature of such involvements of the labyrinth following mumps. He finds this is not an uncommon complication in mumps, and from the study of the symptoms which have been reported in the various cases he finds that there are three distinct types of labyrinthine involvement. First, those cases where the cochlea alone appears to be involved, second, those in which the vestibular apparatus and semicircular canals alone are involved, and third, those cases in which the entire internal ear shows marked symptoms of involvement. Dr. Boot reports two cases, one from the dispensary at Rush Medical College, the history of the other given him by Dr. Shambaugh. He concludes that the pathological changes that take place in the labyrinth of the ear are of an inflammatory character, which stop short of being severe enough to produce a pus infection.

Dr. KAHN thinks that if one wishes to have a correct idea of the extent of involvement of the internal ear following mumps it is necessary that one has made an examination of the hearing previous to the attack. Some of the cases collected by Dr. Boot from the literature are quite incomplete in that no tests had been made for the higher tones, and no record of the presence or absence of nystagmus. He questions the classification as given by Dr. Boot, and states it is his impression that when the semicircular canals are

involved there is invariably a complete loss of hearing from involvement of the cochlea, whereas when the pathological changes take place in the cochlea there need not necessarily be an associated involvement of the semicircular canals.

Dr. SHAMBAUGH thinks that the classification given by Dr. Boot of the three types of labyrinthine involvement based upon the areas of the labyrinth which have been affected as shown from the symptoms of deafness and vertigo is very suggestive. Dr. Boot is inclined to think that the condition is one of mild infection and inflammation. One would naturally expect that an inflammation involving the labyrinth which is extensive enough to produce complete destruction of the function of hearing would also extend and involve the vestibular apparatus and vice versa. The fact that separate and distinct areas of the internal ear are apparently involved in this way following mumps suggests the probability that a process like embolism may be at the bottom of the trouble. It is well known that the arterial supply of the labyrinth comes through a single vessel. An embolus lodging in the labyrinthine artery would produce sudden and general disturbance of the internal ear, since there is no collateral circulation of any importance between the blood-vessels in the labyrinth and those in the surrounding structures. We also know that the branches of the labyrinthine artery that go to supply the vestibule and semicircular canals are quite distinct from those that go to supply the cochlea. Each of these vessels is of the type of end arteries, so that an embolus lodging in any one of them will shut off completely the blood supply for a certain part of the labyrinth. The areas in the labyrinth that are in this way isolated by their arterial supply are, first, the macula acoustica utriculi, together with the ampullæ of the superior and horizontal semicircular canals, second, the ampulla of the posterior semicircular canal, third, the macula acoustica sacculi, and fourth, the cochlea itself. It is plain to see from such a distribution of the arterial supply of the labyrinth how it is possible for such a process as embolism to involve certain and distinct parts of the labyrinth.

Dr. ANDREWS called attention to a case he had examined

where there was deafness in both ears following mumps. A diagnosis of hysterical deafness had been made. After examining the patient he expressed the opinion that it was a condition of labyrinthine involvement due to mumps, and that the prognosis was unfavorable. The patient passed from under his observation, and he cannot make a further report.

Dr. BOOR (in closing), replying to Dr. Kahn, said the patient he examined was totally deaf for the Galton whistle. An examination for nystagmus was made, but it was not apparent without special search, and he does not see any objection to classifying cases according to their symptoms, whether they have disturbed the function of hearing or the function of equilibrium. Most of the cases show an involvement of both the cochlea and the vestibular apparatus, while a few of them show a decided separate involvement. He thinks it probable that the complication of the labyrinth following mumps is much more common than is generally believed. There have not been very many cases reported in the literature.

Case of spontaneous tympano-mastoid exenteration, the result of suppurative otitis media. Dr. A. H. ANDREWS.

Dr. Andrews reported two such cases, and discussed in full the subject of spontaneous exenteration of the mastoid.

Dr. HOLINGER thinks there are two conditions that must be considered in this connection. One is a pressure atrophy of the upper posterior wall of the external meatus, the result of a cholesteatoma of the external canal. The second is a process of necrosis. He called attention to a case of this kind which he had reported some years previously, which he had found in examination of the inmates of the deaf-mute asylum in Jacksonville. In this case there was no facial paralysis, but the whole mastoid process was excavated, opened into the external canal, and was lined with the cholesteatomatous membrane. The centre of the cholesteatoma contained a small nodule of bone sequestrum.

Dr. C. M. ROBERTSON stated that in a case he had examined the posterior upper wall was found to be bulging, and on probing in this region the instrument slipped into a cavity that extended into the mastoid and into the internal ear. He thinks that usually a case of this kind is the result

of sequestrum. He thinks this condition is not at all uncommon in tuberculous patients. A cholesteatoma is well known to produce a result of this kind. He has the impression that a number of cases of this kind have been reported involving not only the mastoid but the internal ear.

Dr. PIERCE has seen but one case of this kind, occurring in a man over forty years old. He was referred to him by an insurance company for examination. There was a history of long-standing discharge from the ear of uncertain origin. The ear had been dry for some years, however, before Dr. Pierce examined him. On examination there was every evidence of a typical radical mastoid. The outer wall of the attic was gone, and there was a large opening where the attic had been about the size of a filbert. There was a strand of connective tissue running from the roof of the attic to the facial canal. The whole was covered with a cholesteatomatous membrane, dry, glistening, partially clear, and the hearing in the ear was exceptionally good.

Dr. J. C. BECK stated that Dr. Dench had shown a case where an exfoliation of the cochlea had taken place, and where after healing tests seemed to show that the patient could still hear in that ear. Dr. Beck thinks this may indicate that there was some remnant of the cochlea left in which the hearing was preserved.

Dr. A. H. ANDREWS (in closing the discussion) said that in his cases the ear was suppurating, the bone conduction was much reduced, and the hearing was so bad that he had to use a tube. In testing with the speaking tube he could not discover that the patient heard better in one ear than the other. In his experience the tuberculous cases resulted in destruction of bone in the form of a large sequestrum. In both of the cases which he reported at this time there had been no sequestrum. He does not believe it could be said from the history or the present condition that it was a cholesteatomatous process. He has two specimens of exfoliated labyrinths which he removed during mastoid operations. In the cases reported the result is so much like the result of a radical mastoid operation that with the exception of the small meatus he would be glad to exhibit the case as evidence of his skill as an operator.

Differential diagnosis between involvement of the labyrinth and hysteria in a case of double suppurative otitis media. Dr. J. HOLINGER.

Dr. Holinger reported several such cases, and discussed at length the tuning-fork findings, illustrating the important points in the differential diagnosis between involvement of the labyrinth and hysterical deafness.

Dr. NORVAL H. PIERCE thinks that probably the majority of cases of acute otitis media of severe type are complicated by some involvement of the internal ear. This is shown by the fact that in these cases the perception for the higher tones is very much reduced for a long time, and often permanently. He has recently re-examined several cases which returned to him after ten or twelve years. The cases had suffered from severe suppurative inflammation of the middle ear. The conditions had healed up, however, and he is now able to demonstrate marked nerve deafness. Such cases are not necessarily the result of suppurative changes in the labyrinth. Dr. Pierce thinks it is more probably a plastic process, and thinks it rather remarkable, in view of the intimate anatomical relation existing between the tympanum and the labyrinth, affording easy access for micro-organisms or their ptomains, that involvement of the internal ear is not more common than it really is. He asked Dr. Holinger about the temperature in one of the cases he described. It has been stated that in suppuration which is confined to the labyrinth there is no elevation of temperature. Such a statement appears rather surprising, yet, coming from such a man as Bezold, it is of considerable importance.

Dr. H. KAHN said the differential diagnosis between hysteria and internal ear trouble was of great interest to him. He found in looking through the literature that there was a general agreement that hysterical involvement of the ear may give tuning-fork tests, which, if taken by themselves, would point towards labyrinthine disease. Hammerschlag has pointed out that in labyrinthine disease of hysterical origin tinnitus and vertigo are usually absent. He relies in his diagnosis of hysteria largely on the difference between the whispered voice test and the tuning-fork tests. The former is heard from three to six metres, whereas the tuning-forks

give pure labyrinthine reactions, so that there is a difference from what one would ordinarily expect. In hysterical deafness there are usually other manifestations of hysteria, especially loss of the tactile sensations localized in the external meatus and even in the membrana tympani.

Dr. GEORGE E. SHAMBAUGH stated that it is not uncommon in severe cases of suppurative otitis media to find unmistakable evidences of involvement of the labyrinth which can be demonstrated by the loss of perception for the higher tones. In a patient recently under his observation the defect for the Edelmann-Galton whistle extended in the one ear as low as mark "14," and in the other ear as far as "9." Within three weeks after the suppuration had subsided the perception for the higher tones had returned, so much so that the Galton whistle could be heard as high as "5" and "4" in the two ears. He does not think there has been a suppurative involvement of the labyrinth in such cases. He believes the pus invasion of the labyrinth must invariably result in total destruction of function. In regard to the case reported by Dr. Holinger of otosclerosis with symptoms of labyrinthine deafness and an absence of ankylosis of the stapes, Dr. Shambaugh believes this must be accepted as one of the established facts in regard to this process. The first cases which were reported, where a diagnosis of otosclerosis was clearly made, were cases of typical ankylosis of the stapes, and, of course, post-mortem findings discovered a spongifying process in the region of the oval window. For this reason the term otosclerosis came to be considered by many as synonymous with bony fixation of the stapes. As a matter of fact the underlying pathological process, that of spongification of the labyrinthine capsule, may take place in parts of the capsule at a distance from the oval window. Here we would find symptoms typical of labyrinthine deafness with an absence of any evidences of fixation of the stapes. The diagnosis of otosclerosis where the foot plate of the stapes has become fixed offers no great difficulty, especially when there has not existed some previous middle ear trouble. The diagnosis, on the other hand, is not so easy in those cases of otosclerosis where the foot plate of the stapes has been left free, and where the deafness is of a labyrinthine type. Yet

in some of these cases a probable diagnosis can be made from the type of the onset, the age of the occurrence of the deafness, the history of other cases of otosclerosis in other members of the family. In such cases the diagnosis will be all the more certain if there is present the reddish glow transmitted through a normal drum membrane from congestion of the promontory.

Dr. A. H. ANDREWS asked Dr. Holinger whether there was any way of making an immediate positive diagnosis of hysterical deafness. He had not been able to say absolutely of any case that it was one of hysterical deafness, although he had been able to say that he believed it to be such, and when the patient recovered suddenly, independent of treatment, he felt certain that the diagnosis of hysterical deafness was the correct one.

Dr. HOLINGER (in closing) said he could not say anything about temperature previous to his own examination. The temperature was taken regularly at the hospital while under his care, and there was no rise in temperature noted. He believes that when a patient can be examined with the tuning-forks a positive diagnosis of hysterical deafness is possible. The psychic element must, of course, be excluded. In regard to otosclerosis he pointed out that Professor Lucae, in his book on chronic progressive deafness, places the word otosclerosis throughout in quotation marks. This is done because in the condition described as otosclerosis there is no sclerotic process present, but a spongifying process of the labyrinthine capsule. Had the expression spongifying been preserved and the term otosclerosis dropped, a good deal of confusion would have been avoided.

REPORT OF THE TRANSACTIONS OF THE SECTION ON OTOTOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

REGULAR MEETING MARCH 13, 1908. DR. A. B. DUEL IN THE CHAIR.

Presentation of Cases.

Case of recurrent keloid of scalp and lobule of ear. By G. H. COCKS. (Published on page 202.)

Discussion.—Dr. DENCH said that he had recently had a case somewhat similar to the one presented, and in which he had suggested the use of either the X-ray or the radium treatment for reduction of the growth. He had referred the case to Dr. Abbe, a well-known authority on the use of the X-ray and of the radium ray, and Dr. Abbe had said that in keloids of this character no benefit could be hoped for. Either the radium treatment or the X-ray treatment might aggravate the case if too prolonged exposure were to cause a burn. Dr. Abbe believed that the best results were obtained, in these cases, by a free excision of the keloid growth and the application of large Thiersch grafts. In the case under discussion, the tissue of the lobule appears to be different from that in the supra-auricular region.

Dr. Dench suggested that the growth in both regions should be treated by free excision and the application of large Thiersch grafts.

Papers.

The toxæmia of latent erysipelas in its relation to otitic serous meningitis. By FRED WHITING, M.D.

(Abstract.)

This paper recites a series of cases of mastoiditis in which certain manifestations arose subsequent to operation, which so strongly simulated the symptoms of meningitis as to lead to a diagnosis of that complication. The cases are five in number, and all present symptoms more or less analogous to each other. In but one case did serous meningitis develop, although the symptoms manifested in every instance rendered the probability of such a complication imminent. All five appeared to be doing perfectly well for three days after operation, when the temperature rose with suddenness to $102-104^{\circ}$, the patients became irritable, and within a few hours a mild delirium supervened, which later became violent; within twenty-four hours after the rise of temperature, coma developed. Upon removing the dressings and investigating the wounds, four of these cases were found to present no inflammatory or other changes; while the fifth case showed a very pronounced bulging of the dura through the opening in the floor of the skull which had been made at the mastoid operation. This meningocele was incised, with the escape of a large quantity of cerebro-spinal fluid, after which the lateral ventricles were tapped, with the escape of additional cerebro-spinal fluid. The removal of this fluid was followed by a rapid rise in the pulse rate of the patient, from 60 to 120, but the character of the respirations, which had been pronouncedly irregular, was unaltered by this relief of pressure. This patient died within twenty-four hours after the evacuation of the cerebro-spinal fluid.

In the remaining four cases, after delirium and coma had persisted for variable periods of time, from twenty-four to forty-eight hours, the integument about the wound showed a blushing discoloration together with œdema and swelling, which rapidly spread upward over the scalp to the vertex of the skull, thence down upon the opposite side of the head and neck. With the appearance of this cellular inflammation upon the integument, making clear the diagnosis of erysipelas, there was a rapid subsidence of delirium and of all other alarming symptoms, intelligence was speedily restored, and control of all physical functions regained.

In all five of these cases many essential symptoms of meningitis were wanting; none the less so closely did the symptoms simulate meningitis that several of New York's most distinguished consultants made unqualified diagnoses of meningitis with equally positive prognosis of fatality.

Of the four cases which recovered, one presented especially severe manifestations. He was suffering from a double mastoiditis, the result of streptococcus infection, and when delirium and coma developed his case was pronounced hopeless, and upon consultation it was advised that nothing in the way of surgical or other relief be attempted. This patient received two subcutaneous injections upon the back of the arm, of anti-streptococcic polyvalent serum, the combined amount of the serum administered being 75ccm. Within a few hours consciousness began to return, and within twenty-four hours was fully restored.

Just what value may properly be attributed to the use of the serum injection must—inasmuch as it was tried in but a single case—remain problematical.

As to the character and extent of treatment to be instituted in such crises as the foregoing histories represent, there is reason in the judgment of the writer for pursuing the following course—namely, when no paralyses have appeared, when Kernig's sign is not present, when examination of the ocular fundus is negative, and when lumbar puncture has resulted in a negative finding,—under such circumstances the writer feels fully justified, upon the appearance of delirium and coma as complicating manifestations in mastoiditis of streptococcus origin, in diagnosing toxæmia of erysipelas as the probable disturbing factor, and in administering an antistreptococcus serum forthwith; in addition to which therapy, in the event that the cases do not improve within twenty-four hours, he would recommend the employment of bacterial vaccines, which can be prepared in one day from the patient's own bacteria, and the dose of which can be accurately regulated to conform to the degree of impairment sustained by the patient's opsonic index, as the result of inflammation.

Dr. GRUENING said that when he first read the title of Dr. Whiting's paper he wondered what would be presented, for the toxæmia of latent erysipelas was not known to him.

He knew erysipelas when present, and he knew that erysipelas can produce all the symptoms of any toxic disease. When we have typhoid or scarlet fever, we also have symptoms of meningeal irritation, but we are not so active and do not consider it necessary to perform surgical operation on the meninges. In mastoiditis and its various complications we often have brain symptoms, viz., vomiting, unconsciousness, optic neuritis, and many conditions which simulate meningitis, but are not actual meningitis. In such cases we are inclined to be too active, and to expose the brain and cut the meninges.

Dr. Gruening said that he had observed cases like those reported by Dr. Whiting, but had not named them latent erysipelas. When, after an ordinary mastoid operation, the patient has a temperature of 104° , restlessness, and vague meningeal irritation, he suspects the nature of the condition and generally finds that the auricle is swollen. This swelling of the auricle accompanied by high temperature is almost pathognomonic of erysipelas. This very day he had diagnosed a case of erysipelas with no other sign than the swelling of the auricle. The patient had been discharged from the hospital, but lingered for two or three days. The physician in charge ceased to take any interest in her, considering her a dispensary patient as her discharge had been signed. When Dr. Gruening saw her she had a temperature of 104° , and on removing the dressing he found the auricle to be swollen. The diagnosis of erysipelas was made, and the patient was sent to the observation house.

Most of the cases of erysipelas reported by Dr. Whiting had been cured without the antistreptococcus serum, so that it was demonstrated that the cases could be cured either with or without this treatment. His own cases were cured without the serum.

Lumbar puncture is not always advisable. If, in the fluid obtained, we at times find leucocytes, polynuclears, and even streptococcus, we are not entitled to make a diagnosis of streptococcic lepto-meningitis. These have been found where there was no meningitis. It is well known that in cases of sinus thrombosis, for instance, the streptococcus enters the blood, the cerebro-spinal fluid, and is found by lumbar

puncture. A diagnosis of meningitis may be made where the condition is one of sinus thrombosis. The patient who suffers from a diffuse streptococcic lepto-meningitis usually dies. In serous meningitis, on the contrary, the patient generally gets well. The cases reported by Macewen were not cases of diffuse purulent lepto-meningitis. They were diagnosticated as meningitis after the escape of a turbid fluid from the arachnoid space. Dr. Gruening had never yet seen a case of diffuse streptococcic lepto-meningitis of the convexity recover, but hoped that by the injection of streptococcus serum, success in treating this condition might be obtained in the future.

Dr. DENCH said that he had very little to add to Dr. Whiting's excellent presentation of the subject. He did not, however, quite agree with Dr. Gruening in regard to the incurability of meningitis, nor in his criticism of Macewen's cases. Dr. Dench had reported in the *Transactions* of the American Otological Society, 1896, volume vi., page 315, a case of otitic meningitis, which had recovered completely after operation. In this instance, Dr. Dench thought that he had to deal with a brain abscess. Upon incising the dura there was a free serous discharge, and as the brain substance looked normal it was consequently not explored. The subdural space, over the tympanic roof, was packed with gauze, and the patient made a complete recovery. This case was under observation for a number of years, and the recovery was absolute.

In regard to the developing of erysipelas, following the mastoid operation, he had seen a number of such cases, but had not found that the erysipelas was necessarily attended by graver symptoms than in those cases of so-called idiopathic facial erysipelas. In a very large proportion of his own cases, where erysipelas had supervened, the erysipelatous inflammation developed at a point remote from the wound. It seemed to the speaker that the term "meningismus" was much more applicable to these cases than the term "serous meningitis," meningismus being a term used to designate certain obscure meningeal symptoms, simulating those of meningitis, and yet where true meningitis could not be demonstrated either before or after death. As a matter of fact, most of the cases

of meningismus recover. This is also true, however, of the cases of serous meningitis. In the International Congress held at Bordeaux, 1904, Lermoyez reported two cases, in which drainage of the subdural space and repeated lumbar puncture had effected a cure. In one of these cases the brain tissue was also incised. In both these cases there were well-marked symptoms of meningitis. Very frequently, lumbar puncture is of no value, but at times it is of considerable therapeutic value in cases of serous meningitis.

With reference to the question of serous meningitis following mastoid operations, Dr. Dench had requested Dr. Charles E. Perkins, one of his assistants in the clinic at the New York Eye and Ear Infirmary, to look over the literature of the subject. Out of 100 cases collated, 38 were of the serous variety. All of these recovered, with one exception, and this was complicated by a small cerebellar abscess.

The operative procedures in these cases varied from the simple mastoid or radical operation, to incision of the meninges and sometimes of the brain substance itself, with drainage of the ventricles.

It would seem, therefore, from this rather extensive series of cases, that serous meningitis, complicating mastoiditis, was not a grave condition.

Regarding the use of anti-streptococcus serum, Dr. Dench had had experience with this in but one single case. In this instance, the patient had suffered from a sinus thrombosis, and, at the same time, from a lobar pneumonia. The condition of the chest precluded operative interference until a very late date. As soon as operation was at all feasible, it was performed, the clot cleared out from the sinus, and the jugular excised. At this time, the patient had streptococci in the blood. An anti-streptococcus serum was administered, but the patient died in spite of the injection of the antitoxin.

Dr. McKERNON said that there was very little that could be said after Dr. Whiting's valuable paper. He agreed with Dr. Whiting that lumbar puncture is of decided value. Two years ago he had a case of the serous type of meningitis following mastoid, where lumbar puncture was done. The patient was twenty-two years of age, and all the symptoms of meningitis developed on the fourth day after operation.

Nearly all the eye symptoms were present. Babinsky's sign was present, there was a low muttering delirium, and the temperature ranged for 100.5° to 105.5° —going up at night and coming down the next day. Lumbar puncture was performed, and the first 30ccm. of fluid came out with a decided pressure—simply spurted out. After that, 10ccm. more were drawn, and this oozed out slowly. After this all the active symptoms subsided for twenty-four hours, when they again appeared and another lumbar puncture was performed, drawing out 18ccm. of serous fluid which did not exhibit signs of pressure. On the first puncture the fluid was examined, smears were made and cultures taken, but all proved negative. The fluid from the second puncture also proved negative. Two days later the symptoms occurred again, and another lumbar puncture was done. After that the symptoms improved and the patient went on to recovery. Lumbar puncture has a distinct value in serous meningitis.

Dr. McKernon said that he did not think all cases of purulent meningitis ought to be given up as hopeless. Two years ago he had briefly reported a case which had been operated upon during the active stage of meningitis. Lumbar puncture was performed before the mastoid operation, and the fluid was found to be filled with streptococci. Mastoid operation was done that night. The patient was in a very extreme condition. A large area of the dura was exposed, and over the floor of the middle fossa the dura was bulging. After the operation had been completed, the dura was incised here, and a large amount of cloudy fluid came out. Some of this was collected in a test tube and upon culture contained streptococcus pure and simple. The high temperature continued for eight or ten days; lumbar puncture was performed five or six times, and the patient went on to complete recovery. If no attempt is made to save a case of purulent meningitis it will certainly die, but if one is saved out of a large number it is a decided advantage.

Dr. McKernon also had observed the swollen auricle which Dr. Gruening had referred to as being one of the first signs in erysipelatous cases. Not twenty-four hours before he had been called in consultation, and one of the first things that he had observed was a distinct erysipelatous blush

over the auricle, spreading finally over the face. In the last four or five years he had seen several cases of erysipelatos rash following a mastoid operation, but the erysipelatos condition did not seem to proceed further and disappeared on the application of ichthyol and collodion. It did not seem to be a true erysipelatos inflammation. He thought there was a distinction to be made between a true erysipelous inflammation and the streptococcus rash which we sometimes see.

He had had no experience with the streptococcus antitoxin, but saw no reason why it should not be tried in private cases.

Dr. GRUENING said that he did not regard those cases in which lumbar puncture was performed and streptococci found and which afterwards recovered, as cases of purulent meningitis. In his previous remarks he had referred to cases of purulent lepto-meningitis. There are various conditions in which streptococcus may be found in the cerebro-spinal fluid and yet not be a meningitis. The very fact that these patients did get well was to him sufficient proof that they did not have lepto-meningitis.

Dr. SEYMOUR OPPENHEIMER reported a case under his observation—not of erysipelas, but in connection with the question of anti-streptococcus injections. The patient was a little girl, nine years of age, seen first twelve days before in a state of coma, with a temperature of 106.5°. She could not be aroused, and was very pronouncedly delirious. She had all the evidences of acute mastoiditis. A diagnosis of acute mastoiditis with intracranial complication was made. She was operated upon promptly, and the mastoid was found to be enormously destroyed, and the sigmoid sinus contained a thrombus. Blood cultures showed the presence of streptococcus. There was a large necrotic area over the roof of the tympanum, through which quantities of pus escaped. This area was removed, and behind it was found a large amount of purulent material. The dura was bluish black. Incision was made and the underlying brain substance was found to be undergoing softening. There were very decided adhesions of the dura to the brain substance itself, and areas of fibrinous exudate. The diagnosis of meningitis was made. The operative findings were meningitis, extradural and sinus

thrombosis, complicating acute mastoiditis. Lumbar puncture was performed, and the fluid withdrawn contained large quantities of pus cells, but no bacteria. The following day the patient was still in a comatose state, and it was suggested that injections of antistreptococcus serum be made into the spinal canal. This was done after the withdrawal of a large quantity of cerebro-spinal fluid, which was still purulent, and under great pressure. Twenty-four hours later the patient was more rational and has continued to improve to the present time, although there is present a large area of necrotic brain substance, involving the temporo-sphenoidal lobe. Transitory aphasia is present. A second blood culture was made which proved to be sterile. Cerebro-spinal fluid is now clear. The idea of intra-spinal injection of anti-streptococci serum is somewhat in advance of Dr. Whiting's suggestion in regard to its hypodermic use.

Dr. W. SOHIER BRYANT said that he had never had a case of erysipelas of his own and consequently had had little experience with the disease. He had had a case of streptococœmia of aural origin which did not improve after anti-streptococcic vaccination although some of the vaccine used had been prepared from the patient's own organism. The essential difficulty was the length of time before the beneficial effect of the vaccine could appear. The patient finally died of extensive thrombosis, streptococœmia, and meningitis. This case was published about a year ago.

Dr. DUEL said that in the experiments with antistreptococcus serum both brilliant results and complete failures have been reported, and that the point which Dr. Whiting had made of the necessity for recognizing the difference in the virulence of the organism was most important. Most of us are optimistic enough, from the reports which have been made, to feel that we are on the eve of great discoveries in the line of antistreptococcus serum, but there must be some method of recognizing the different varieties of the organism before we can reach any state of perfection in the matter.

REGULAR MEETING APRIL 10, 1908. DR. A. B. DUEL, CHAIRMAN.

Reports of cases.

Case of cholesteatoma. Presented by J. E. SHEPPARD, M.D.

The patient was a male, aged 35 years, when first seen in March, 1897. Some 15 years before, when he was 19 or 20 years old, he had a mastoid trouble of some kind. At that time Wilde's incision was considered the proper treatment for such conditions, and this operation was performed. Judging from the scars now present, he evidently had at that time at least three sinuses running down his neck, and one over the anterior portion of the occipital bone. When I first saw him the auricle was projecting from the side of the head, there were œdema, redness, and tenderness of the mastoid, and one or two of these old sinuses open. He was sent to the hospital for operation, and a large mass of cholesteatoma was removed from the mastoid region behind the ear. The wound finally skinned over with a large opening behind the ear. The posterior canal-wall was gone, so that one could look directly into the canal, the tympanic cavity, and down into the mouth of the Eustachian tube. After healing had been accomplished, the problem of closure by means of a plastic operation presented itself, but I always had the feeling that it was unnecessary and possibly unwise. The patient was kept under observation for four or five years, and then was not seen until almost two weeks ago, an interval of six or seven years. He then reported at the office, saying that for the last week or two and occasionally through the winter he had had a little pain around the temporal region which he thought was due to cold, but that the last attack had been a little more severe and persistent than the others, and that when wiping out the old depressed cavity some little white particles came out on the cotton. Examination revealed on the posterior surface of the old operated cavity an appearance closely resembling that of a spot of mycosis on the tonsils. On digging into this through the old opening part of a two-ounce bottle full of cholesteatoma was removed. A week later he was put under an anæsthetic in the Jewish Hospital, and the cavity emptied. In cutting down through the old scar over the occipital bone a large mass of cholesteatoma was found. The outer as well as the inner cortex had been destroyed over a large area. This you will remember is the second cholesteatomatous growth in this patient, and in clearing it out the former operated

cavity was entered, and the two cavities thrown together.

One word more. It does not seem to me that this is a part of the first cholesteatoma in any other sense than that the two originated in the same process. It is my opinion then that this growth began when he was 19 or 20 years of age, and had no connection with the one which was operated upon in 1897. The leaving of the old wound open was possibly his salvation, for in the concentric growth of this mass it came to the surface in the old operative wound first, and had it not become visible in this region the cholesteatoma might have easily extended entirely unsuspected, even to the point of perforation of the dura.

Discussion.—Dr. DENCH said that about ten years ago, he had operated upon a case of extensive cholesteatoma, closing the posterior wound. During the last year, the patient had suffered from some aural symptoms, and on inspecting the meatus, he was able to see a mass of cholesteatomatous deposit. He operated a second time, again closed the posterior wound, and the operation had been followed by a complete cure. He believed that in all of these cases the posterior wound should be closed, and that the external auditory meatus should be sufficiently enlarged in order that every portion of the operative cavity may be inspected through the external auditory canal. By following this plan it is possible to deal with any recurrence of the cholesteatomatous deposit directly through the enlarged external meatus.

Dr. Dench inquired if Dr. Sheppard believed that the secondary cholesteatoma had its origin from the epithelial tissues of the neck. As far as he knew, no similar case had been reported in literature. In all cases of cholesteatoma, he was in favor of making a large external meatus, and completely closing the posterior wound.

Dr. SHEPPARD said that he thought it grew from one of the sinuses which formed back in '82 when the original Wilde's incision was done. The present scar indicates that there was a sinus open at that point, and it seems to him that a second desquamating focus developed, which had no connection whatever with the focus previously opened.

Dr. ALBERTON said that we may have to revise the idea of cholesteatoma originating in the tympanic cavity. He

had had a case last year which had existed for a long time previous to operation. There were a number of isolated foci in the mastoid process. There was no direct connection between the tympanic cavity and these foci and yet there were evident cholesteatomatous masses in the isolated cavities.

Dr. DENCH said that he had found isolated masses of cholesteatomatous material in the mastoid cells. He reported last year two cases of extensive cholesteatomatous deposit, involving all the mastoid cells. He was inclined to believe that the epithelial elements of the growth were always derived from the epithelium of the external auditory canal finding an entrance into the tympanic cavity. If this were not the case, we should certainly have to revise our pathology of cholesteatoma of the middle ear and mastoid.

Dr. SHEPPARD, in closing the discussion, said—referring to the closing of the wound—that the patient has already a good-sized meatus, but the angle was a wide one and the introduction of a straight probe demonstrated the impossibility of seeing within $\frac{1}{8}$ of an inch of the edge where the cholesteatoma broke through. Unless there had been an extraordinarily large external meatus the condition would certainly have escaped observation.

A new instrument for the treatment of diseases of the ear. By Dr. E. P. FOWLER, published on pages 205-210.

Discussion.—Dr. DUEL said that he could testify to the suction power of the apparatus for he had seen it used on patients at the Manhattan Eye and Ear Hospital and had introduced it at the Babies' Hospital. This testimony was unnecessary, however, for all had seen the demonstration. It has not yet been put on the market, but he hoped it would be soon, for it was a very useful addition to our armamentarium.

Dr. MEIERHOF said—referring to the force of the fluid on the mastoid cells—that there would not seem to be any danger of the fluid finding its way into the antrum owing to the inflamed mucosa of the aditus, but that in young children there might be danger where there were dehiscences in the roof of the tympanum. The apparatus seems to have a very wide method of application, especially since the BIER method of

treatment is so much in vogue. It can be used in the ear also without douching, where BIER recommends the keeping up of continuous suction processes.

Dr. FOWLER said that the apparatus had been used very satisfactorily for other purposes than that for which it had been originally constructed.

Dr. DIXON presented **a skull showing abnormalities of formation.**

Dr. Dixon said that when he saw by the announcement card that Dr. Dench would report a case of sinus thrombosis following removal of granulations from the middle ear he had thought that the members would be interested in seeing this skull. At the Infirmary, through the work of Mr. Burchell, they had opportunity to examine a great many temporal bones and skulls, and during the past week or ten days they had been fortunate in finding this one. It was asymmetrical. On the right side the cerebellum seems to have been small. The vertical ridge of the occipital was pushed to one side and there was scarcely any sinus groove on the right. There were two openings of exit from the skull, which apparently transmitted a divided sinus. There was no dome or jugular fossa on that side. On the left side the sinus groove was large and far forward. The dome was found to be very large, so that a thumb might be passed into it. There were dehiscences at the side and one at the top, so that it would have been a very easy matter to set up a primary trouble in the bulb of such a dome. He had seen many hundreds of skulls, but never before one like this. The whole skull seemed to be twisted, and the right side of the brain had apparently been atrophied.

(a) **Unusually atypical case of sinus thrombosis. Importance of blood culture in diagnosis.** By SEYMOUR OPPENHEIMER, M.D. Published on pages 197-201.

Dr. DENCH said that while the blood culture was a valuable aid to diagnosis, he thought that the temperature chart in Dr. Oppenheimer's case would have enabled one to make the diagnosis perfectly, without any blood culture. While a blood culture is valuable in these cases, it is seldom essential to diagnosis.

Dr. OPPENHEIMER, replying to Dr. Dench, said that the

neck symptoms appeared on the same day as the rise in temperature, following a three-days' normal temperature.

Dr. SHEPPARD recalled two cases, both women, one aged 76 the other 82. He had not looked up their histories of late, but they seem to have differed from the Doctor's group of cases in that both had perforated membranes and sufficient pain and tenderness to make clear the fact that something needed to be done.

In response to a query as to whether any of the cases showed diabetes, Dr. ALDERTON replied that they did not.

(b) **Cases of mastoiditis in the aged.** By H. A. ALDERTON, M.D. Published on pages 190-196.

Discussion.—Dr. DUEL said that last year he had reported an interesting case similar to those which had just been reported. The patient was an old man who had suffered from pain in the mastoid for three weeks. On examination there was no evidence of any middle ear suppuration, but, on opening the mastoid cells on account of extreme tenderness, all the cells were found filled with pus. There was also an abscess in the neck resulting from a perforation of the cortex at the mastoid tip.

In reply to a query from Dr. Dixon as to whether any bacteriological examination had been made, Dr. DUEL answered in the negative.

(c) **Case of mastoiditis complicated by purulent meningitis, encephalitis, phlebitis of sigmoid sinus, jugular bulb, and internal jugular vein. Operation; recovery.** By J. F. McKERNON, M.D. Published on pages 183-189.

Discussion.—Dr. SHEPPARD congratulated Dr. McKernon on the results obtained in this case, and inquired whether he had ever tried the experiment of puncturing the spinal cavity, withdrawing fluid, and injecting a $\frac{1}{2}$ per cent. solution of lysol. He himself had tried this on a desperate case during the past winter, which showed all the evidences of a meningitis which had lasted for several days. The intracranial cavity was opened and drained through the mastoid, the spinal cavity was punctured, and $2\frac{1}{2}$ ounces of spinal fluid were withdrawn, and a like amount of $\frac{1}{2}$ per cent. lysol solution injected. The case terminated fatally within 24 hours, so that he

had no success with this method to report, but he would like to know if others had tried it, and if so with what result. Reports of its use in a small number of cases make it seem worth while perhaps to have this in mind in addition to other methods. This case showed a streptococcus infection.

Dr. McKERNON, replying to Dr. Sheppard, said that he had had no experience whatever with injections of lysol.

(d) **Case of sinus thrombosis following removal of granulations from the middle ear. Excision of Internal Jugular Vein. Recovery.** By E. B. DENCH, M.D. Published on pages 211-214.

Discussion.—Dr. DUEL said that he would be glad to have an expression from the members as to whether it was their custom to remove granulation tissue and send the patients home directly afterward. This question had been very actively discussed in the NEW YORK OTOLOGICAL SOCIETY, with widely varying opinions as to the advisability of doing so.

Dr. McKERNON said that he believed such a procedure (the removal of granulations and sending the patient home) to be extremely dangerous. He had had a case attended with fatal result where the patient had been kept in the hospital for 48 hours after the granulation tissue was removed. There was only granulation tissue, no polypoid growth, etc., but 48 hours later a meningitis developed, and in three days the patient died. The autopsy showed purulent lepto-meningitis. He had also seen three other cases among his colleagues attended with similar results. It is much safer to do the radical operation, learn how much damage has been done and take proper care of the case.

In reply to a query from Dr. Sheppard as to how the granulation tissue was removed, Dr. McKERNON replied that it was done with a dull curette.

Dr. SHEPPARD said that it had been his rule for a number of years to be very chary of the use of the curette. If the granulation tissue was removable by a snare, well and good; but if it was so small that it was not capable of this kind of treatment he was inclined to remove it with caustics, but in either case was accustomed to letting his patients go home afterwards. He had always been afraid of a curette in such cases. He thought it was better to remove it by the slower method and keep the patients under observation.

Dr. MEIERHOF said that during a very long service in dispensary work he had removed granulation tissue from the middle ear many times, and had never to his knowledge such an experience as had been reported. In using the curette it should be applied softly and not against the bony base from which the granulations spring, especially in children where they recur very often. He was in the habit of putting alcohol in the ear, and then inserting cotton mops into the canal and wiping the granulations with some force. The mops are made fairly firm, and in a manner the granulation masses are squeezed or pressed and in this way one can get rid of them after a little time. They are liable to recur in children after some weeks, but by teaching the mothers how to wipe the granulation masses with alcohol their recurrence can be prevented. Merely putting in the alcohol is not sufficient, but by pouring in the alcohol and wiping it out down to the fundus of the canal there will be a considerable absorption of granulation tissue and an entire disappearance of suppuration. The syringe should not be used in these cases as the pressure of water favors the growth of granulations.

Dr. DUEL inquired whether Dr. Meierhof saw any danger in the use of the curette. It was a considerable matter to the mothers to use the hard cotton mop. He had understood him to say that the curettage should be done very gently, and that subsequently he taught that the hard cotton mop should be used.

Dr. MEIERHOF replied that it had been his habit in some cases to simply use the cotton mops to wipe out the granulation tissue—not using the curette at all.

Dr. OPPENHEIMER asked if there was not labyrinthine suppuration in those cases where Dr. McKernon had spoken of leptomeningitis following the removal of the granulation tissue, and possibly a fistulous opening leading into the labyrinth?

Dr. McKERNON replied that he had been present at the autopsy in all the cases, and there was a perforation through the tegmen.

In reply to an inquiry as to whether the patient was operated upon the same day, Dr. DENCH answered in the negative.

The patient was kept under observation for 24 hours and during that time the temperature was practically normal.

Dr. DENCH said that he was very glad to hear the men express themselves as they had done this evening, for at a recent meeting of the New York Otological Society, he had been severely criticised for advancing the opinion that in all cases in which granulation tissue was found in the external auditory canal, and where there was a history of a chronic purulent discharge, it was better to perform the radical operation at once. He had taken this view of the matter, and had advocated radical operations in all cases where the external auditory canal was filled with granulation tissue, together with a history of a chronic purulent otitis media. He sometimes advised the removal of the granulation tissue first, following this operation with frequent antiseptic irrigation of the canal, in order to secure a more aseptic field for the radical operation. He had always held that it was absolutely unsafe to remove granulation tissue in the clinic, and then send the patient to his home. Whenever granulation tissue is to be removed, as the first step of the radical operation, the patient must invariably be kept in the hospital, under close observation. Dr. Dench agreed perfectly with Macewen, who pointed out, a number of years ago, that by the removal of granulation tissue an avenue of infection was opened, which might lead to infection either of the meninges or of the sinus. His own case showed clearly how sinus infection had occurred as the result of the removal of granulation tissue.

Series of cases of mastoiditis with a great lack of symptoms.

J. E. SHEPPARD, M.D.

The great dearth of symptoms, together with the enormous cell destruction extending toward the occipital bone, as well as an unusual involvement of zygomatic cells, and the fact that, with one exception, all were cases of staphylococcus infection, was the combination which led him to think this series of consecutive cases worth reporting.

Two or three of the cases had a little pain in the parietal region, another had only pulsating tinnitus, with deafness; two had the drum membrane opened on two occasions, and closed up with cessation of discharge, and the process still going on in the mastoid. One case, a child of four years,

complained of slight headache, without other symptoms, and had been playing around in its usual manner, so that the mother was very much astonished to learn of the true condition. In another case, the child had been ill with the measles and pneumonia, and knew of no ear trouble until the night before the case was seen by Dr. Sheppard, at which time there was distinct swelling over the mastoid. In this case, too, the parents were very much surprised to think that operation was necessary. In another case, the patient was a sailor who had been thrown against the mast, striking his head in the left fronto-temporal region, with nose-bleed following. The next day the left ear discharged some fluid. As to that patient, from December 19th until the day of operation, January 4th, he had been trying with daily observation to make up his mind whether or not there was trouble in the mastoid. There was no temperature, no pain, only a little pulsating tinnitus, which was not constant. A suspicious sagging of the postero-superior canal wall was the point upon which the diagnosis for operation was finally based.

In another case the patient was a nurse, seen early in December, suffering with violent pain in both ears, which had lasted in one ear for 24 hours, and in the other 6 hours, before the doctor was called in. Both drums were incised at once, and staphylococcus was found. As in the other cases, the symptoms practically all subsided excepting the pulsating tinnitus. One ear was operated upon December 16th, and there was found an enormous destruction of the mastoid, but it was not until January 14th that the second ear was operated upon, and this was only done because the doctor was afraid not to, as the patient did not seem to get well; and considering the experience with the first ear where there were practically no symptoms and the tenderness was nil, although very hard pressure was made, it seemed wise to operate on the second ear also, when a condition similar to that found in the other cases was disclosed.

Dr. DENCH asked if he was correct in understanding Dr. Sheppard to say that the membrana tympani had been incised two or three times. The speaker felt very strongly upon this subject. He was convinced that if myringotomy was thor-

oughly done the first time and no relief followed, or if the opening closed, and symptoms either of retained secretion in the middle ear or mastoid symptoms of temperature, not assignable to any other cause, continued, this, in itself, was a sufficient indication for opening the mastoid. He believed that repeated myringotomy was unwise, in these cases, as it simply served to mask the symptoms.

In reply to the inquiry as to whether he would not perform a second myringotomy, Dr. Dench said that he would not do so, provided the first myringotomy had been thoroughly performed. In his experience, covering a number of years, he had rarely found it necessary to do a second myringotomy.

Dr. SHEPPARD said that sometimes he did a second myringotomy when he was not satisfied that anything else was necessary, and when believing that the case might yet clear up. He had had consultants from New York give such advice, and he had done it himself frequently, and supposed it was the usual thing to do in border-line cases. In addition to a second incision of the drum membrane in the last case reported he had had the pathologist give the patient two injections of polyvalent (opsonic) fluid, the idea being that with a little boost nature might bring her through without operation, but it was without avail for the mastoid was completely gutted out, the same as in the other ear.

REPORT ON THE PROGRESS OF OTOTOLOGY DURING THE SECOND QUARTER OF THE YEAR 1907.

BY PROF. ARTHUR HARTMANN, BERLIN.

Translated by Dr. ARNOLD KNAPP.

ANATOMY AND PHYSIOLOGY.

527. CALAMIDA, U. Varieties and anomalies of the mastoid process. *Arch. int. d'otol.*, etc., xxiii., No. 2.

528. EWALD and JADERHOLM. All noises if they are interrupted become intermittent tones. *Pflüger's Arch. f. die ges. Physiologie*, cxv., pp. 555-563, 1906.

529. GEIGEL. The importance of the auricle for hearing. *Münchn. med. Wochenschr.*, 1907. No. 30.

530. ABELS. On after-sensations in the kinesthetic and static sense. *Zeitschr. f. Phys.*, xliii., pp. 268-269 and pp. 374-422.

BREUER. Remarks on the above paper. *Ibid.*, xlv., pp. 85-91.

ABELS. Is after-vertigo caused in the end-organ or is it nervous? Answer to the remarks of Dr. Breuer. *Ibid.*, xlv., pp. 85-91.

531. HARMAN, N. BISHOP. The origin of the facial nerve. *British Med. Journal*, 1907, ii., p. 1296.

532. GUTHRIE, T. Development of the mastoid. *British Med. Journal*, ii., p. 986.

527. CALAMIDA. *Varieties and anomalies of the mastoid process.*

The size and extent of the antrum and of the other mastoid cells were examined during the course of four hundred operations on the mastoid process in the Gradenigo clinic, and the different varieties and anomalies noted. The results cannot be compared with those obtained from the cadaver. In 3.25% of the cases the sinus was contiguous to the anterior wall of the auditory canal.

OPPIKOFEK.

528. EWALD and JADERHOLM. *All noises if they are interrupted become intermittent tones.*

The method of experimentation of the authors was as follows: The noises were produced in an isolated room so that they could not be perceived by the observer directly, *i. e.*, without telephonic transmission. They were produced directly on the plate of a receiving telephone on which shot was caused to rotate, or sand was brushed, or the plate was directly exposed to a stream of water. In each case the noises were produced with a view to clearness and without the production of any individual tones. The intermissions were produced by interrupting the current which connected the receiving telephone with the delivery telephone. To bring about this interruption two tuning forks were used in rotation, one with 100 vibrations per second, the other with 128. The interrupting fork, driven electrically, closed the contact with one plate which was in connection with a hard metal contact point; on vibrating upwards the opening resulted. The 100-fold and 128-fold interruptions of the noise were always perceived in the receiving telephone as a tone of 100 or 128 vibrations, and according to the well-known rapid picture of Ewald, that uniform periodic interruptions, not only of tones but also of noises, produce in the ear subjective sensations of tone, the authors have been led to regard their results as confirmatory of Ewald's theory of hearing. They have, however, forgotten to prove that these interrupted tones are not produced physically in the telephone membrane. The reviewer inclines to regard this as most likely after his large experience with membrane clang-tones and interrupted tones. In any case, the noise interruption tones of these authors are not explained and do not advance our knowledge of hearing in any particular way. KARL L. SCHAEFER.

529. GEIGEL. *The importance of the auricle for hearing.*

Hearing is supposed to result principally from the transmission of sound waves from the air to the cartilage in the auricle, then to the cartilaginous canal, the bony canal, and finally to the drum membrane, while the air conduction directly through the drum membrane is of much less importance. Geigel comes to this conclusion through the following explanation: On approaching the hand to the auricle, at first without touching it, a noise is heard more loudly; if the auricle is touched the noise is very much more intense.

The reviewer is not able to confirm this last observation. Geigel, moreover, thinks he has observed a confirmation of his views from the fact that the hearing is not diminished when the ear canal is closed with cerumen which is not in contact with the drum. This observation is clearly erroneous, as it is well known that on occluding the ear the hearing is very much worse.

SCHEIBE.

530. ABELS and BREUER. *On after-sensations in the kinesthetic and static sense.*

This excellent and suggestive paper of Dr. Abels is principally a critical one. He reviews the facts published by Mach, Breuer, Hitzig, Jensen, Ewald, and others from new view points. Abels does not support Breuer's hypothesis that the ampulla generates the irritation. Breuer assumes as is well known, that at the beginning of rotation towards the right the endolymph remains in the right horizontal semicircular canal, and thus the cupola is displaced along the canal towards the ampullary crest of the right semicircular canal. If the rotation continues for any length of time the cupola returns to its normal position, partly by elasticity of the ciliary processes and partly through the retraction of mucous bands and mucous ducts. If this point is not attained the irritation of the hair-cells of the ampullary crest and the sensation of rotation continues. Abels does not believe that a sensation of long duration can follow an irritation acting for only a moment, for in that case the sensation of the vestibular apparatus would be different from all other organs of sense.

He gives another explanation of the fact why a sensation persists for some time which is generated at the first moment of a rotation of some duration. He believes that a centrifugal force which constantly acts during rotation—in other words, a continuous active acceleration—is perceived for quite a long time, and that this completes the feeling of rotation. Breuer answers this view of Abels by stating that the centrifugal force only causes a perception of deviation from the vertical and has nothing to do with the sensation of rotation. If we disregard this sensation we will discover a vestibular nystagmus persisting for quite a long time on rotation continuing for some time. Experiments which the reviewer has made

on the rotating chair and the rotating disk have shown, as was to be expected, that this nystagmus is entirely independent of the centrifugal force. It can, therefore, only originate in the semicircular canal apparatus. This probably shows the incorrectness of Abels's view that an irritant working for a moment in the ampulla can produce only a momentary effect, and it can be regarded as settled that this momentary irritation can produce an action of some duration which sometimes consists in a sensation of rotation which persists for some time, and at other times in a nystagmus which is reflexly produced and also persists for some time. This, however, does not in any way prove Breuer's hypothesis of the generation of irritations in the ampulla. This, in fact, can only be proven by direct inspection. One can perceive that a momentary blow of the endolymph may be active as a vestibular irritant, and that the duration of the sensation, *i. e.*, the nystagmus, can be produced by the generation of certain forces in nerve centres (Deiters's nucleus). Up to a certain point we are forced to assume central causes to explain nystagmus. If we should examine nystagmus during rotation or the after-nystagmus in a large number of individuals, we would find enormous differences in the duration of the horizontal nystagmus. The greatest extremes vary between 14 seconds and 2 minutes. A great difference will be observed in the same individual between the duration of the horizontal and of the rotatory or vertical nystagmus. While the sensation of apparent rotation in horizontal after-nystagmus is the shortest and weakest, this may often persist for $1\frac{1}{2}$ minutes longer than the rotatory or vertical nystagmus which rarely lasts longer than 15 to 20 seconds. These facts can only be explained as of central origin, as the condition of the sense-organs cannot cause such differences. The phenomenon of the secondary after-nystagmus which appears in the direction of rotation can only be explained centrally. Abels cites the well-known experiment of Ewald with the pneumatic hammer to prove his contention that the blow of the endolymph which produces the irritation can only cause a momentary effect. In this case the glass hammer which is fastened to the canal resembles in action a slight movement of the head. Breuer has already replied that in

this experiment the nerve apparatus must certainly have been damaged and that the cupola was certainly torn away.

The reviewer has made similar observations to Ewald's experiment in persons with labyrinth fistulæ. If the vestibular apparatus had already lost by disease its sensitiveness for rotation and irrigation, condensation of air and rarefaction in the external auditory canal and pressure on the fistula would at once result in a single slow ocular movement. In cases, however, in which the sensitiveness was not affected, this experiment resulted in producing marked nystagmus lasting for five minutes. This observation shows the decided though brief duration of a momentary irritant.

Dr. Abels's remarks on galvanic after-vertigo are highly interesting. One fact this author has not sufficiently dwelt upon, *i. e.*, that vertigo and nystagmus are produced by the opening of a galvanic current. If the cathode is placed at the right ear, on opening the current rotatory nystagmus to the left is produced exactly of the same character as if the anode were placed on the right side, only then of less intensity and duration. The cause of this vertigo on the opening of the galvanic current, according to Abels, is the preceding irritation of the centres by the galvanic current. In this connection it must be further remarked that if the cathode is placed near the ear, the vestibular nerve is put in a condition of catelectrotonus. This produces a continuous irritation of the nerve, its conducting power is increased, and peripheral irritations are more easily transmitted. Breuer has assumed that a constant slight movement of the endolymph is present in both labyrinths, and that these movements act as independent irritations. As the movements in the two labyrinths are produced simultaneously, normally the two opposed irritations neutralize each other. If, however, catelectrotonus is present on the right side, then the irritations from the right labyrinth are increased, and nystagmus to the right is produced. Even if one does not support Breuer's hypothesis of independent irritations of this nature, one must nevertheless assume that constant irritations are carried on to Dieters's nucleus, either from the sensory cells or from the vestibular ganglion, and the action of the anode which produces nystagmus to the opposite side cannot be

explained in any other way than that the anelectrotonus prevents the transmission of irritations to that side and that in this way the opposite side has a preponderance. The onset of nystagmus on opening the current can also be explained by the fact that after the cessation of a catelectrotonus a transient diminution of the conducting power of the irritated nerves takes place, thus allowing the opposite side to preponderate. It is also possible that in the production of nystagmus on the opening of the current, the diminution of the conducting power in the irritated nerve as well as central processes are of moment. We can assume with great probability that Deiters's nuclei are factors in preserving a constant vestibular tonus of the eye muscles, inasmuch as the right nucleus constantly discharges inhibitory impulses which will produce a horizontal and rotatory nystagmus to the right side if they are not neutralized by the symmetrical inhibitions of the left nucleus. If the cathode produces an increase of the irritation on the right side, nystagmus, an accumulation of impulses occurs in the left nucleus, and on opening the cathode these are discharged and cause nystagmus to the left. This theory agrees with Abels's explanation in discussing the deceptive impressions of the kinesthetic sense—for instance, the sensation of being lifted up on suddenly letting fall a very heavy weight. This explanation is as follows: If the conditions of irritation of two different nerves whose sensations preserve equilibrium should neutralize each other, and through an external cause be displaced for some time, the sensations of the nerve group which have not been irritated for some time will be destroyed, and a negative after-picture will be produced of the sensation of a movement in the opposite direction to the direction of force.

Abels cites the observation of Jensen, where, after extirpation of the labyrinth galvanic irritation had no effect. On the other hand it must be mentioned that we have had opportunity to examine in the clinic a number of cases where the labyrinth had been extirpated, yet nevertheless on this side a typical galvanic nystagmus could be produced by a correspondingly strong intensity of current. One can only think here that the effect is due to radiations of the current to Deiters's nucleus.

Dr. Abels furthermore discusses the fact of becoming accustomed to vertigo. In the case of pigeons which received for a number of days several hundred rotations always in the same direction, a marked diminution of the head nystagmus was observed, not only on rotation but also on the cessation of rotation. On rotating in the opposite direction, no diminution in the rotatory or after-nystagmus was noted. This can only be explained by assuming an adaptation of the nerve centres. In man, a diminution of the sense of vertigo while learning to dance soon takes place. Ruppert who examined the after-nystagmus in such persons found that the nystagmus seemed much less marked while rotation was in the accustomed direction than when they rotated in the opposite direction. The reviewer has not yet observed such differences in the intensity and duration of the after-nystagmus in passive rotation on the rotating chair. The difference in vertigo is restricted chiefly to the subjective sensations and to the diminution of the movement of reaction.

At the end of his paper Abels describes the short turning movements of the head which under normal conditions occur most frequently. Breuer explains that the reason after-nystagmus does not occur after these rotations lies in the fact that the cupola again returns to the normal by the opposite force to the displacement which occurs in the beginning. According to Abels this only takes place in rotations executed with uniform rapidity and then suddenly is arrested or moved in the opposite direction. The conditions of tension and contact in the ampullary structures must cause a comparatively greater displacement after rapid movements than after slow ones.

Even if we have to contradict emphatically Dr. Abels's statements, and we have no reason to assume that Breuer's hypothesis has been shaken, Dr. Abels nevertheless deserves credit for having first drawn attention to the importance of central processes in the theory of the vestibular apparatus.

BÁRÁNY.

531. HARMAN, N. BISHOP. *The origin of the facial nerve.*

Bishop Harman controverts the hypothesis of Mendel that the orbicularis palpebrarum, frontalis, and corrugator muscles are innervated primarily by the third cranial nucleus;

and the corollary that the orbicularis is innervated by the twelfth nucleus. He shows from his own researches that the facial musculature embryologically is derived directly from the spiracle musculature; that is, it is a visceral musculature which had in its earliest inception a visceral innervation arising from the facial complex nucleus, a visceral nucleus which belongs to the second order of nuclei of Gaskell's classification.

Bishop Harman considers with Edinger that the seventh nucleus forms a chain of nuclei extending some distance in the medulla and not forming, as too many erroneously believe, a single clump. It is the longitudinal position of the nucleus which is the clue to these coincidental paralyses of eye-muscles innervated from the third nucleus and the orbicularis palpebrarum from the seventh, or of the muscles supplied by the twelfth and of the so-called orbicularis oris of the seventh. A lesion in the region of the third nucleus may involve the neighboring dorsal part of the seventh, or one in the region of the twelfth nucleus may affect the not far distant ventral and inferior portion of the seventh nucleus.

HUNTER TOD.

532. GUTHRIE, T. *Development of the mastoid.*

As a result of microscopic specimens of foetal temporal bones ranging from two and a half to seven and a half months of foetal life, Guthrie confirms the fact that the antrum is essentially a part of the middle-ear cleft and is not formed as a diverticulum of the tympanum. Three drawings of specimens are appended.

HUNTER TOD.

GENERAL.

a.—REPORTS.

533. BENTZEN. *Annual Report of the Oto-Laryngological Department of St. Elizabeth's Hospital in Copenhagen.* 1905-1906.

In addition to statistics the report contains the two following case histories:

1. A woman twenty-two years of age with chronic suppurating otitis, headache, and vertigo. Radical mastoid operation performed. Ten days later symptoms of pyæmia.

The sinus was then exposed and found to contain fluid blood, also a small thrombosed vein was found and removed. Recovery followed.

2. A man forty-seven years of age with a facial paralysis of four weeks' standing; pain in the ear for four weeks and some discharge. On the right side there is a serous maxillary sinusitis which is evacuated by puncture. The facial paralysis is improved by electric treatment. JÖRGEN MÖLLER.

b.—GENERAL PATHOLOGY AND SYMPTOMATOLOGY.

534. HAMILTON, ALICE. *Pseudodiphtheria bacilli as cause of suppurative otitis, especially postscarlatinal.* *Jour. Infectious Diseases*, June 15, 1907.

535. HAMILTON, ALICE. *Opsonic index and vaccine therapy of pseudodiphtheritic otitis.* *Jour. Infectious Diseases*, June 15, 1907.

536. DUNN, C. H. *Serum treatment of epidemic cerebrospinal meningitis.* *Boston Medical and Surg. Jour.*, March 19, 1908.

537. RUGANI, L., and FRAGOLA, V. *On the influence of exertion on hearing.* *Arch. ital. di otologia*, etc., xviii., Part 4.

538. JÜRGENS, E. *Affections of the ear, nose, and throat following the explosion of bombs and fire-arms.* *La presse otolaryn.*, 1907, Part 5.

539. BROCK. *Examination of the function of the semicircular canal apparatus in normal individuals and in deaf-mutes.* *A. f. O.*, lxx., pp. 222-262, lxxi., pp. 56-84.

534. HAMILTON, ALICE. *Pseudodiphtheria bacilli as cause of suppurative otitis, especially postscarlatinal.*

Two varieties of pseudodiphtheritic bacilli are especially found in the pus of postscarlatinal otitis media. The first group ferments saccharose but not maltose and is seldom virulent for guinea-pigs; group two ferments maltose but not saccharose and is often more virulent than the former. These varieties are found so frequently in otitis as to render it probable that they play an important part in its causation. No less than 72% of the 43 cases of acute scarlatinal otitis media gave cultures of these bacilli and 20% thereof gave pure cultures. Only 21% of the cases of acute non-scarlatinal otitis gave the same bacilli. The belief that these bacilli may cause suppurative otitis is greatly strengthened by the fact that the opsonic index of the patients for these bacilli has been found to undergo marked variations, and that the

injection of corresponding vaccines appears to definitely modify the course of the infection. CLEMENS.

535. HAMILTON, ALICE. *Opsonic index and vaccine therapy of pseudodiphtheritic otitis.*

Twenty-two cases of otitis media from which the pseudodiphtheritic bacillus had been isolated were selected and their opsonic index to their own strain was determined. The study of the indices obtained offers a strong argument for the pyogenic character of this bacillus. Cases of otitis media which have the pseudodiphtheritic bacillus as the predominating organism in the pus have usually a low opsonic index. Where repeated examinations are made, the index may be found to cover a wide range and the change in the index often corresponds to changes in the clinical symptoms, the amount of discharge increasing as the index falls, and diminishing as it rises. Injections of dead cultures of the strain isolated from the patient results in an increase of the opsonin for that strain. No ill effect follows such injections and an apparent improvement has resulted in several cases, but a more extended experience is necessary before their value is definitely determined. Inasmuch as the opsonin in the blood of such patients is a specific for this variety of bacillus, and because of the fluctuations of the index during the course of the otitis, this apparent improvement is considered strong proof that the pseudodiphtheritic bacillus plays an etiologic rôle in certain forms of otitis media. CLEMENS.

536. DUNN, C. H. *Serum treatment of epidemic cerebro-spinal meningitis.*

The personal experience of the writer with Flexner's serum comprises fifteen cases, in all but one of which the diagnosis was confirmed by the finding of the diplococcus intracellularis. Of these patients eight have completely recovered, two have died, and five are still pending. The recoveries were free from any of the usual sequelæ of the disease. Both the fatal cases had been running for a considerable time before coming under observation. These results appear sufficiently good to afford a strong basis for the belief that the treatment will prove of considerable value. The serum should be used early, lumbar puncture being made as soon

as the disease is suspected, the antiserum being injected through the same needle, without waiting for bacteriological examination if the fluid obtained is notably cloudy. When no fluid is withdrawn it is questionable whether it is a safe procedure, though Dunn has used it in this way without bad results.

CLEMENS.

537. RUGANI, L., and FRAGOLA, V. *On the influence of exertion on hearing.*

After examining soldiers with healthy and affected ears, the authors conclude that exertion always produces a diminution of hearing, which is bilateral and varies according to the intensity of the exertion, and is recovered from after a period of rest of varying duration.

RIMINI.

538. JÜRGENS, E. *Affections of the ear, nose, and throat following the explosion of bombs and fire-arms.*

Thirteen cases of injury to the ear after bomb explosions are related. The ear closest to the site of the explosion was always most involved. In some cases there was an immediate discharge of blood from the ear, while occasionally there was suppuration with a picture of subacute otitis. There was nothing characteristic about the perforation. Vertigo was only complained of in one instance. The main symptom was diminution of the hearing for the low tones, with a tendency to improvement and recovery. No explanation is given why a hemorrhage or concussion should be located in the apex of the cochlea. According to his impression, after a single severe explosion or after repeated explosions, the topographic location of the nerve terminations or the nerve trunk is of less importance than an unknown process, possibly of an inflammatory nature. The results of a single injury, therefore, have a tendency to recover, while repeated injuries do not improve. It is a striking fact that the semicircular canals in these explosions are intact. (To be concluded.)

BRANDT.

539. BROCK. *Examination of the function of the semicircular canal apparatus in normal individuals and in deaf-mutes.*

Under the guidance of Denker the fifty inmates of the Nürnberg deaf-mute institution were carefully examined for

disturbances of hearing and of equilibrium. The results of his examinations as far as they concern disturbances of equilibrium are related in this paper with full literature annotations. His conclusions are as follows:

1. Complete bilateral deafness is in most cases acquired after birth.

2. The result of examination for nystagmus after rotation or the injection of fluids of varying temperature into the ear canals is usually negative in cases of bilateral deafness.

3. For one-sided deafness there is no definite rule.

4. Group VI. of those with better hearing react like those with normal ears to experiments of rotation and irrigation of the ear.

5. Groups I.-V. cannot be arranged in a definite scale as regards the function of the semicircular canals.

6. My investigations have shown that in general the results of the rotatory experiments coincide with the results of the experiments for caloric nystagmus, consequently:

7. For the examination of disturbances of equilibrium and to determine the preserved or lost function of the semicircular canals, Bárány's method of irrigating the ear with warm and cold water and the examination of the consequent nystagmus is very valuable, as this method gives more definite data than can be obtained by the examination of each ear alone for disturbances of equilibrium.

8. The onset of nystagmus in the opposite direction after injecting water above or below body temperature suggests that the movement of the endolymph from the smooth end to the ampulla or in the opposite direction seems to generate an irritation.

ZARNIKO.

C.—METHODS OF EXAMINATION AND TREATMENT.

540. STENGER. Simulation and dissimulation of ear diseases and their determination. *Deutsch. med. Wochenschr.*, 1907, No. 24.

541. HALD. Hypopharyngoscopy. *Hospitalstidende*, 1907, No. 17.

542. SCHMIEGFLOW. On esophagoscopy, tracheoscopy, and bronchoscopy. *Ugeskrift for Læger*, 1907, Nos. 20-23.

543. HERSCHEL. A new aural electrode. *Deutsch. med. Wochenschr.*, 1907, No. 23.

544. STEIN. A new paraffine syringe, with remarks upon the boiling point of paraffine. *Hospitalstidende*, 1907, No. 18.

545. LEUWER. A new aural suction apparatus. *Deutsch. med. Wochenschr.*, 1907, No. 25.

546. VOHSEN. On suction and congestion treatment in affections of the ear and upper respiratory passages. *Münchn. med. Wochenschr.*, 1907, No. 9.

547. BARATOUX. The use of thiosinamine in otology. *La progrès médical*, 1907, No. 3.

548. EYSSELT. The results of treating cretins with thyroid substance. *Wiener med. Wochenschr.*, 1907, Nos. 1, 2, 3.

549. MOSZKOWICZ. On the technic of operation on the hypophysis. *Wiener klin. Wochenschr.*, 1907, No. 26.

540. STENGER. *Simulation and dissimulation of ear diseases and their determination.*

Stenger describes the methods advanced by Voltolini, Coggin, Bloch, Lucae, and others for the detection of persons simulating ear disease. It is usually cases of one-sided, rarely bilateral high-grade deafness, also sometimes a simulation of deaf-mutism and ear disease, which one has to deal with, usually in connection with an accident. An objective determination of simulation is not always possible, and in order to detect the fact that an individual is simulating it is necessary for the examiner to be fully acquainted with the disease processes and methods of examination of the ear, as well as to have a good knowledge of human nature. The determination of dissimulation, *i. e.*, the hiding of functional disturbances, is of importance in persons who follow a calling which demands the integrity of their ears. NOLTENIUS.

541. HALD. *Hypopharyngoscopy.*

In addition to a historic review of the development of this method, the author reports a case of carcinoma of the hypopharynx where it was only possible to make a diagnosis by means of hypopharyngoscopy. JÖRGEN MÖLLER.

542. SCHMIEGELOW. *On esophagoscopy, tracheoscopy, and bronchoscopy.*

In addition to a review of the technic and indications there are many case histories. Of affections of the esophagus there is a case of cicatricial stricture, one of formation of a diverticulum, and two of foreign bodies. JÖRGEN MÖLLER.

543. HERSCHEL. *A new aural electrode.*

The author believes that the electric treatment of the ear

in neuralgia, deafness, and tinnitus from affections of the auditory nerve has met with so little favor because there has been no special instrument, and describes an ear and throat electrode. The reviewer is ready to acknowledge that these electrodes are very practical, but they seem to be extremely complicated. The results are only briefly given.

NOLTENIUS.

544. STEIN. *A new paraffine syringe, with remarks upon the boiling point of paraffine.*

The syringe consists of a solidly built cylinder and piston which present screw surfaces throughout their length. The simple, solid construction of the syringe allows the easy injection of hard paraffine in solid substance.

JÖRGEN MÖLLER.

545. LEUWER. *A new aural suction apparatus.*

Leuwer gives a description, also an illustration, of an apparatus for aspirating pus from the middle ear. The instrument is made of glass with a funnel-shaped tip for the external canal, also a dilated portion for the evacuated pus, and an opening for the attachment of the rubber bulb. NOLTENIUS.

546. VOHSEN. *On suction and congestion treatment in affections of the ear and upper respiratory passages.*

Both on congestion and on aspiration the pharyngeal tubal openings were found to be closed, by means of Hirschmann's endoscope. It is to be assumed that the narrow openings of the pneumatic cells and of the accessory cavities are also closed by the swelling of their mucous membranes. The application of Lugol's solution to the normal pharyngeal mucous membrane causes a greater hyperemia than suction or congestion. The healing influence of congestion on acute and chronic catarrhs of the nose and pharynx cannot be ascertained. In ozæna the crusts could not be any more easily removed. To remove the discharge from the accessory cavities, Vohsen suggests a condensation of air combined with rarefaction which the patient is to perform himself with his nose closed.

SCHEIBE.

547. BARATOUX. *The use of thiosinamine in otology.*

Fibrolysin was injected and thiosinamine instilled into the

auditory canal in fifteen patients without any influence on the deafness or tinnitus. Occasionally some improvement was observed when, in addition to the injections of fibrolysin, mechanical treatment was used. OPPIKOFER.

548. EYSSELT. *The results of treating cretins with thyroid substance.*

Forty-six selected cretins were treated for one year with thyroid substance. They received daily a tablet of 0.3 gr. The results were good as regards growth, especially of the thyroid gland, and the general condition. Of particular interest are the observations regarding the disturbances of hearing and speech. The former varied from slight to complete deaf-mutism. Treatment brought about a definite improvement. Cretins who formerly heard conversation with difficulty, after treatment for from six to twelve months could understand a whisper. Cases with severe affections of speech and hearing approaching deaf-mutism showed practically no improvement. To obtain good results in cases with total defect of the thyroid gland, the treatment must be continued in small doses throughout the life of the patient. In cases, however, in which the glandular function was still present the treatment could be interrupted after two to four years. WANNER.

549. MOSZKOWICZ. *On the technic of operation on the hypophysis.*

This is a description of an operation which has thus far only been performed on the cadaver. In the first stage the nose is displaced upward, the septum, turbinates, and ethmoid are removed, and the sphenoid cavity is opened, but the final bony layer is left intact. A pedunculated flap of skin is then taken from the forehead and placed upon the base of the skull so that its apex projects into the sphenoidal cavity. As soon as this flap has healed, the second stage of the operation is begun and the final bony lamina is removed, and after removal of the tumor the tip of the skin flap is pressed into the base of the sella turcica and a tampon applied. The illustrations describe the method and the necessary instruments. WANNER.

EXTERNAL EAR.

550. CITELLI. *Dermoid cyst of the lobule.* *Arch. intern. d'otol.*, etc., xxiii., No. 2.

551. BINDI. *Primary epithelioma of the auricle.* *Arch. italiano di otol.*, etc., xviii., Part 4.

552. HÉLOT. *Worms of the ear.* *Arch. intern. d'otol.*, etc., xxiii., No. 3.

553. TÖRÖK. *Occlusion of both auditory canals with partial bony obliteration of the tympanic cavity.* *A. f. O.*, lxx., pp. 213-218.

550. CITELLI. *Dermoid cyst of the lobule.*

A tumor half the size of a pea, hard and painless, had been present in the left lobule of a patient thirty years old, for six years. Pain occurred after incomplete operation. Healing took place on extirpation. The histological condition is described.

OPPIKOFER.

551. BINDI. *Primary epithelioma of the auricle.*

Report of a case operated upon by the author. There are in addition clinical, histological, and therapeutic observations.

RIMINI.

552. HÉLOT. *Worms of the ear.* The author draws attention to the frequency with which in previous centuries worms were diagnosticated in the ear canal, and the great rôle which they were supposed to play, especially in affections of the head. The author states that in neglected suppurations the larvæ of flies have been found. It is not stated whether this is a personal observation.

OPPIKOFER.

553. TÖRÖK. *Occlusion of both auditory canals with partial bony obliteration of the tympanic cavity.*

A girl, fourteen years of age, presented the following conditions on examination and operation: Bilateral occlusion of the auditory canal at the inner extremity of the membranous part. The bony external meatus and the auricle are normal. The mastoid processes and the tubes are normal. The tympanic cavities are constricted by a bony mass, which in the direction of the oval window and the promontory is adherent to the labyrinth wall. On cutting the membranes the hearing was very much improved.

ZARNIKO.

MIDDLE EAR.

a.—ACUTE OTITIS.

554. SÜPFLE. Studies on the bacteriology of acute otitis. *Zentralbl. f. Bakteriologie*, xlii., 1906.

555. SALAMO. Certain peculiarities of mastoiditis in nurslings. *Arch. intern. d'otol.*, etc., xxiii., No. 3.

556. PREOBRASHENSKI. On the aspiration of pus in acute and chronic otitis. *Jeshemessj atschnik uschnych, gorlowych i nossowych bolesnej*, May, 1907.

557. ESCHWEILER. The treatment of mastoiditis with congestion hyperemia after Bier. *A. f. O.*, lxxi., pp. 85-110.

558. FRÖSE. Further observations on clinical experiences in the treatment of middle-ear suppuration with congestion hyperemia after Bier. *A. f. O.*, lxxi., pp. 1-55.

559. BACON, GORHAM. Some of the lesions of the middle ear due to influenza. *N. Y. Med. Journ.*, April 13, 1907.

554. SÜPFLE. *Studies on the bacteriology of acute otitis.*

At Kümmel's suggestion, fifty-seven cases of otitis media were examined bacteriologically. In the normal external canal numerous micro-organisms were found; in 70% of the cases micrococcus pyogenes albus was the organism. Streptococcus or pneumococcus were never present. The normal tympanic cavity in general is sterile. The material examined was divided into meso-tympanic otitis and epi-tympanic otitis after Kummel. It was found, however, that in clinically similar forms bacteria of various kinds were found, while at other times in clinically different forms the same bacteria were present. The following are the author's conclusions:

The number of cases examined is not sufficient to draw any general conclusions. One important fact, however, seems assured, *i. e.*, that our previous views on the bacteriology of otitis media are not well founded. Further bacteriological examinations are required in order to determine this question definitely.

1. Most cases of otitis are due to streptococcus. This is especially to be emphasized, as the general opinion is that pneumococcus is in preponderance.

2. In addition to the streptococcus pyogenes, which was found present in 60% of the exudates, there are other varieties

present such as streptococcus lanceolatus, streptococcus mucosus, and micrococcus pyogenes.

3. The organisms from the group of the chain coccus usually appear in pure cultures. Sometimes they are associated with staphylococcus although this association is of secondary importance.

4. On the other hand the micrococcus pyogenes may be the only inciting factor and then is as important as the chain coccus. This is, however, unusual.

5. Generally clinical pictures cannot be designated according to the bacteriological conditions observed.

6. In the individual case the bacteriological examination does not give us any prognostic data. The probability is, however, that an otitis with a sterile exudate will heal, that a staphylococcus otitis generally will not lead to complications, and that a pneumococcus otitis will rarely do so. If the discharge contains the streptococcus pyogenes or mucosus there is about an even chance for recovery without as with operation.

7. Origin, course, and duration of acute otitis media depend less upon the variety and virulence of the micro-organisms than upon the general or local progress of the disease.

BRÜHL.

555. SALAMO. *Certain peculiarities of mastoiditis in nurslings.*

Cases of mastoiditis in nurslings are not unusual, the author having collected 134 cases from the children's clinic of Broca. The symptomatology is not unusual. The author himself believes that in some of these cases a simple opening of the antrum would have been sufficient, and that the radical operation (in 21%) was probably not so often indicated. As tuberculosis was often present and as the general condition before operation was frequently poor, it is not astonishing that the mortality was 13%.

OPPIKOFER.

556. PREOBRASHENSKI. *On the aspiration of pus in acute and chronic otitis.*

On the basis of his experience the author's conclusions are:

1. Aspiration cleanses the middle ear, relieves the retention and prevents the disintegration of pus.
2. It prevents retraction of the drum and adhesions to the promontory.
3. It favors the closure of perforations of the drum membrane.
4. It can replace paracentesis in small or highly situated perforations.
5. In certain cases aspiration may prevent opening of the mastoid process.
6. An ideal dry method of treatment can only be carried through in conjunction with the aid of aspiration. SACHER.

557. ESCHWEILER. *The treatment of mastoiditis with congestion hyperemia after Bier.*

The author again comes out as an enthusiastic advocate of Bier's congestion hyperemia in the treatment of acute mastoiditis. Eleven cases are reported of which eight were healed. Four were complicated with purulent periostitis over the mastoid process. The recovery of a case of scarlatinal mastoiditis and of a case with decided disturbance of the general condition are especially worthy of note. Of the three cases which were not healed, two died from causes not referable to the hyperemia; the third case was lost sight of. In the appendix three further cases are reported of which one was complicated with diabetes. All of these resulted favorably.

ZARNIKO.

558. FRÖSE. *Further observations on clinical experiences in the treatment of middle-ear suppuration with congestion hyperemia after Bier.*

Continuation of the reports of Isemer in Schwartz's clinic, with a description of eighteen cases, of which eleven (three with bilateral suppuration) were healed after the application of Bier's congestion, combined in three with suction. In five cases a typical mastoid operation had finally to be resorted to. In a sixth case the suppuration continued copious, and in the case of a child the congestion treatment had to be discontinued. The description of the etiology, mastoid complications, duration, and the results of the microscopic and bacteriologic examinations must be

read in the original. In general the congestion was well tolerated, the subjective symptoms being particularly favorably influenced. In some cases inflammation of the auditory canal was brought on; in two cases the treatment led to a middle-ear catarrh in the unaffected ear, and in one case to a hemorrhage from the middle ear in a patient of apoplectic habit. The author concludes as follows:

1. The anatomic structure of the mastoid process and the unfavorable position and narrowness of its natural openings for drainage offer great difficulty to the successful use of the congestion hyperemia of Bier in mastoiditis.

2. Because the vessels which surround the mastoid lie in bony canals and therefore cannot dilate, in the congestion intervals the resorption of the inflammatory foci is interfered with, while during the congestion there is a cumulative irritation in the mastoid and the formation of stasis and sequestration is favored.

3. This unfavorable course seems to be the rule in severe infections of the middle ear and mastoid which before the congestion had not led to subperiosteal abscess. The prognosis is rendered unfavorable even though the ear disease be of short duration, through the presence of adenoids or constitutional diseases.

4. Tuberculosis of the mastoid process can probably not be healed by congestion.

5. The domain of congestion therapy should be limited to cases of mild acute uncomplicated otitis and genuine subacute cases with mastoiditis, and not to recent acute cases with mastoid disease where a periosteal abscess exists on the mastoid process. In the latter cases the simultaneous use of the dry cup is indicated.

6. If paracentesis of the drum membrane is necessary it is important that it should be kept from healing.

7. Chronic suppurations without caries and cholesteatoma seem to be favorably influenced by congestion hyperemia, though they frequently require other treatment. If osteosclerosis is suspected this treatment would not be indicated.

8. Of importance is the determination of the degree of virulence of the organisms. Other things being equal, a

staphylococcus infection seems to make the prognosis more favorable.

ZARNIKO.

559. BACON, GORHAM. *Some of the lesions of the middle ear due to influenza.*

From the statistics of the New York Eye and Ear Infirmary Bacon states that twenty years ago but twelve or, at most, twenty mastoid operations were performed. In 1889, the year that the influenza made its appearance, the number of operations increased very suddenly. In 1897 there were one hundred and sixty-one, and in 1905 five hundred and fifty-five operations. While allowance for the whole increase in the number of patients admitted each year is made, the conclusion is reached, however, that influenza plays a very important part in causing acute inflammation of the middle ear. In some cases of mastoiditis multiple incisions of the drum are recommended to encourage free drainage.

CLEMENS.

b.—CHRONIC PURULENT OTITIS.

560. MUCK. The effect of congestion hyperemia on purulent otitis. *Münchn. med. Wochenschr.*, 1907, No. 9.

561. ISEMER. Two cases of aural vertigo cured by operation. *Münchn. med. Wochenschr.*, 1907, No. 1.

562. STEIN. The after-treatment of radical mastoid operations without packing. *A. f. O.*, lxx., pp. 271-282.

563. GERBER. After-treatment without packing and occlusion of the tube. *A. f. O.*, lxx., pp. 263-270.

564. GERBER. Tubal occlusion after radical mastoid operation. *A. f. O.*, lxx., p. 211.

565. TÖRÖK. Caries of the horizontal semicircular canal associated with unusual clinical symptoms. *A. f. O.*, lxx., pp. 219-221.

566. GOLDSMITH. A case of primary bilateral mastoiditis. *Montreal Med. Jour.*, 1907, xxxvi., p. 696.

567. MILLIGAN. Surgical treatment of labyrinthine suppuration. *British Med. Jour.*, 1907, ii., p. 983.

568. BRYANT, W. SOHIER. Rapid convalescence after mastoid operations. *Laryngoscope*, April, 1907.

560. MUCK. *The effect of congestion hyperemia on purulent otitis.*

In twenty cases of obstinate chronic suppuration of the middle ear, suction was tried for from one to two minutes with

intervals of one minute for a quarter of an hour, with good results. The suction treatment is recommended in acute purulent otitis where the perforation is unfavorably located.

SCHEIBE.

561. ISEMER. *Two cases of aural vertigo cured by operation.*

Chronic purulent otitis with sudden vertigo. No other labyrinth symptoms. Recovery after radical operation.

SCHEIBE.

562. STEIN. *The after-treatment of radical mastoid operations without packing.*

The reviewer reports excellent results in the after-treatment without packing. It is hoped that other operators will now give this method a trial.

ZARNIKO.

563. GERBER. *After-treatment without packing and occlusion of the tube.*

The author has had excellent results with the method of after-treatment of mastoid operations without packing. In order to close the tube, transplantation of Thiersch grafts was often attempted; it is not seen in the case histories, however, with what results.

ZARNIKO.

564. GERBER. *Tubal occlusion after radical mastoid operation.*

For many years the author has attempted to close the tube after radical mastoid operations with paraffine injections. His experiments, however, have failed, possibly because the paraffine was too soft. The most practical method seems to him to be the primary transplantation of epidermis grafts over the tubal opening.

ZARNIKO.

565. TÖRÖK. *Caries of the horizontal semicircular canal associated with unusual clinical symptoms.*

Chronic otitis from scarlet fever. Exacerbation with pain, vertigo, vomiting, and marked nystagmus on looking toward the unaffected side. On asking the patient to fix the finger held a short distance before the eye, there is a sudden decided convergence of the eyeballs. After a few

seconds the eyes return to the normal position. At operation there was found to be a fistula in the horizontal semicircular canal, and cholesteatoma. After operation there was no further vomiting, but still slight vertigo, nystagmus, and some disturbance of convergence. ZARNIKO.

566. GOLDSMITH. *A case of primary bilateral mastoiditis.*

The patient was a lady, aged sixty-one. An influenzal head-cold was followed a week later by pyrexia and pain in the head. The tympanic membranes were normal and the hearing not impaired. Four days later there was tenderness over the mastoid process, with bulging downwards of the upper and posterior wall of the external meatus. The portion of the membrane still visible appeared normal. Schwartz's operation was performed on both sides; the mastoid cells were found filled with pus, with an extradural abscess over the lateral sinus on the right side. The case made a complete and uninterrupted recovery. HUNTER TOD.

567. MILLIGAN. *Surgical treatment of labyrinthine suppuration.*

In this paper, Milligan gives the chief paths of infection of the labyrinth from the middle ear; also the ordinary method of opening the vestibule between the external and posterior semicircular canals, after performance of the complete mastoid operation. Illustrative photographs are given together with a special instrument devised by the author to protect the facial nerve during this operation. HUNTER TOD.

568. BRYANT, W. SOHIER. *Rapid convalescence after mastoid operations.*

The cases reported show the results of treatment by blood-clot in simple mastoid operation; of drawn blood-clot for simple mastoid operation; in an infected mastoid wound after the use of the drawn blood-clot, and an infected case after a mastoido-tympanic operation. Five of the cases show rapid and satisfactory healing by first intention, two cases by second intention after infection and sloughing of the wound. The case of epidural abscess treated by drawn blood-clot was followed by rapid and uneventful healing by first intention.

CLEMENS.

C.—CEREBRAL COMPLICATIONS.

569. TARTURRI. Severe and sudden endocranial complications in a case of acute purulent otitis. Operation. Recovery. *Bollettino delle malattie dell' orecchio*, xxv., No. 7.

570. HABERMANN. Contribution to the study of cerebral abscess of otitic origin. *Arch. intern. d'otol.*, etc., xxiii., No. 2.

571. DE STELLA. Abscess of the temporo-sphenoidal lobe and otitic meningitis. *Arch. intern. d'otol.*, etc., xxiii., No. 2.

572. DELSAUX. Six cases of thrombophlebitis of the cranial sinuses of otitic origin. *La presse otolaryn.*, 1907, No. 7.

573. RENSHAW, KNOWLES. Case of radical mastoid operation, with subsequent septic infection and rupture of the lateral sinus. *British Med. Jour.*, 1907, ii., p. 1208.

574. BRONNER, ADOLF. A case of thrombosis of the lateral sinus and obliteration of the jugular vein. *British Med. Journ.*, 1907, ii., p. 982.

575. LANGWORTHY. Thrombosis of the cavernous sinuses. *Boston Med. Jour.*, April 25, 1907.

576. RICHARDS, JOHN D. Case of cerebellar abscess. *N. Y. Med. Jour.*, May 4, 1907.

569. TARTURRI. *Severe and sudden endocranial complications in a case of acute purulent otitis. Operation. Recovery.*

The patient, twelve years of age, suffered from right-sided purulent otitis. Shortly after onset there was severe headache and vomiting; temperature 39.8° ; comatose condition. Right-sided abducens paralysis. At operation an extradural abscess was found in the middle cranial fossa. The external surface of the sinus showed granulations. After the operation the severe endocranial symptoms rapidly disappeared. The paralysis of the right abducens greatly diminished. RIMINI.

570. HABERMANN. *Contribution to the study of cerebral abscess of otitic origin.*

A patient thirty-one years of age suffered for sixteen years from suppuration of the middle ear on the right side, which led to an abscess of the temporal lobe. Interesting in the history was the fact that the temperature never rose above 37.8° C. and that in addition to paralysis of the left arm there was a left-sided anosmia and a left-sided deafness (interference with the tracts in the internal capsule). Operation; recovery. After evacuation of the abscess the paralysis

of the arm and the anosmia disappeared, and the hearing was improved in both ears. OPPIKOFER.

571. DE STELLA. *Abscess of the temporo-sphenoidal lobe and otitic meningitis.*

Abscess of the temporo-sphenoidal lobe and meningitis in the course of a middle-ear suppuration in a patient twenty-five years of age. As the symptoms were indefinite the abscess was not detected until autopsy. OPPIKOFER.

572. DELSAUX. *Six cases of thrombophlebitis of the cranial sinuses of otitic origin.*

If the jugular vein is to be ligated this must be done at a sufficient distance from the place of infection, consequently the ligation must either be done very deep in the neck or it must be performed very early. If the neck shows symptoms of thrombophlebitis the jugular must be ligated in the region of the clavicle. If there are no clinical signs in the neck it is better not to disturb the jugular. Irrigation is used as a means to diminish the severity of the infection but has no influence on the disease of the venous walls. BRANDT.

573. RENSHAW, KNOWLES. *Case of radical mastoid operation, with subsequent septic infection and rupture of the lateral sinus.*

Seven days after the primary operation, at which a small portion of the outer wall of the lateral sinus was exposed, there was pyrexia, followed two days later with a rigor and temperature of 104.8°. On opening the wound there was sharp hemorrhage due to rupture of the outer wall of the lateral sinus which presumably had become septic at the point where it had been exposed at the first operation. In spite of subsequent attacks of intermittent pyrexia, the case recovered without ligation of the jugular vein. A remarkable temperature chart is appended. Antistreptococcal serum was given, but, as in many of such cases, was of no apparent value. HUNTER TOD.

574. BRONNER, ADOLF. *A case of thrombosis of the lateral sinus and obliteration of the jugular vein.*

A case of chronic otorrhœa with pain over the right side of the head for one year. Owing to the occurrence of rigors,

of pain on pressure over the right mastoid, and of swelling of both optic disks, the complete mastoid operation was performed. The sinus was exposed and incised; there was free hemorrhage. An attempt was made to ligature the jugular vein in the neck, but it could not be found nor could the vagus be seen. The facial vein ended in a thickened sheath and a fibrinous band which was evidently the jugular. There was complete recovery. Bronner considers that this case proves that in all cases of suspected disease of the sinus the jugular should be ligatured, even if the upper part of the sinus is apparently normal. HUNTER TOD.

575. LANGWORTHY. *Thrombosis of the cavernous sinuses.*

A detailed report of four cases following otitis media suppurativa is given. In one was mastoiditis, facial paralysis, thrombosis of the lateral sinus, both cavernous sinuses, and the internal jugular vein. The second case was complicated by an extradural abscess; the third by bronchopneumonia, and the fourth by meningitis. All the cases died from pyemia. The author urges immediate drainage in such cases. CLEMENS.

576. RICHARDS, JOHN D. *Case of cerebellar abscess.*

This case of cerebellar abscess followed chronic suppurative otitis. It was successfully evacuated and rubber drainage tubes were inserted, which were later replaced by perforated bone tubes. No attempt was made to introduce the finger into the brain or to indulge in unnecessary manipulation. The case is alive and in good health. CLEMENS.

d.—OTHER MIDDLE-EAR DISEASES.

577. BOTELLA. *Sarcoma of the middle ear.* *Arch. intern. d'otol.*, xxiii., No. 2.

577. BOTELLA. *Sarcoma of the middle ear.*

The patient, forty-three years of age, has had a fetid discharge from the right ear for four months. The canal is filled with small polypi which bleed spontaneously and on microscopic examination prove to be sarcomatous. There is no pain and no facial paralysis. Deafness. On opening the mastoid process it was found that the malignant tumor

started from the aditus. One year after operation no recurrence. A review of the literature is given at the close of the case history.

OPPIKOFER.

NERVOUS APPARATUS.

578. SCHÖNBORN. Acute cerebral polyneuritis with involvement of the auditory nerves. *Münchn. med. Wochenschr.*, 1907, No. 20.

579. BÁRÁNY. Examination of the reflex vestibular and optic ocular movements and their importance for the topical diagnosis of ocular paralyses. *Münchn. med. Wochenschr.*, 1907, No. 22.

580. STERN. On cysts in the fourth ventricle. *Zeitschr. f. klin. Med.*, 1907, lxi., p. 64.

578. SCHÖNBORN. *Acute cerebral polyneuritis with involvement of the auditory nerves.*

Report of a case of acute disease of the left abducens, facial and both auditory nerves with termination in recovery.

SCHEIBE.

579. BÁRÁNY. *Examination of the reflex vestibular and optic ocular movements and their importance for the topical diagnosis of ocular paralyses.*

A case of total paralysis of ocular movements in which irritation of the vestibular apparatus elicited movement of the eyes in a direction of a slow movement of nystagmus, while the rapid movements of vestibular nystagmus as well as optic nystagmus were absent, has led Bárány to assume that the slow movement of nystagmus is vestibular in origin, while the rapid component depends upon voluntary innervation in the contralateral visual centre. This is also suggested by the fact that in narcosis the rapid components are absent in irritation of the vestibular apparatus. The author gives a schematic description of the tract along which the irritation travels in causing nystagmus. Interesting case histories follow which show the importance of vestibular nystagmus for the topical diagnosis of ocular paralysis.

SCHEIBE.

580. STERN. *On cysts in the fourth ventricle.*

The symptomatology and diagnosis of cysts in the fourth ventricle are based on four personal cases and sixty-eight found in literature. Of special importance for diagnosis is the varia-

tion between the onset of severe intracranial symptoms and complete well-being with regression of all focal signs. Almost complete remissions of long duration can occur in (vascular) tumors, though at the time of general well-being there are generally certain focal symptoms if they were present during the period of aggravation. Bruns's local symptom is of importance in diagnosis. The author mentions only this symptom of Bruns described in 1902, and makes no reference to a similar symptom published in 1898 by Schmidt. Schmidt's symptom consists in that the patient on assuming a certain position of the head suffers from vomiting, or vomiting, vertigo, and tinnitus. Schmidt believes he can determine the site of the tumor from the position which the patient assumes. Oppenheim, who was the first to appreciate the importance of position in the onset of attacks of vertigo, and observed this symptom in labyrinth affections, in diseases of the vestibular nerve, the cerebellar peduncles, and cerebellum, was not able to confirm this law of Schmidt. None of these authors has paid any attention to the onset of nystagmus. The reviewer has observed vertigo, rotatory nystagmus, typical vestibular disturbances of equilibrium, nausea and vomiting, as well in diseases of the labyrinth as in diseases of the cerebellum,—as tumors at the base of the skull in the region of the auditory nerve. He regards Schmidt's and Bruns's symptom and Oppenheim's observation as a sign of irritation of the vestibular nerve, either in its peripheral termination or in its course. The symptom, consequently, does not permit any exact localization. The associated conditions, as well as the intensity and frequency of their occurrence, may sometimes permit an exact diagnosis. Stern considers as the cause of Bruns's symptom a sudden increase of intracranial pressure. This is not clear when one considers that in disease of the vestibular nerve the same symptom occurs when there is no possibility of increasing intracranial pressure. In the reviewer's opinion the symptom can be explained on the ground of an abnormal irritability in the area of the vestibular nerve; this causes attacks of nystagmus on slight changes in the position of the head. Stern's observations are interesting on the suggestion treatment of cerebellar ataxia in certain cases. This corresponds with the experience of the reviewer

that in those cases where vertigo and disturbances of equilibrium appear, in the intervening period between the attacks, disturbances of equilibrium without vertigo may be present, of a neurotic nature, which are then amenable to suggestive treatment. It is important, however, not to fall into the error of regarding an organic disease as an hysterical symptom. Disturbances of the cochlear nerve, such as tinnitus and deafness, were observed in only four cases. Meyer regards these as due to compression of the striæ acousticæ. According to many neurologists, disturbances of the acoustic striæ have no influence on the hearing. BÁRÁNY.

NOSE AND NASO-PHARYNX.

a.—GENERAL PATHOLOGY AND TREATMENT.

581. GUTMANN. External eye diseases in their relation to nasal affections. *Deutsche med. Wochenschr.*, 1907, Nos. 20, 21, 22.

582. HARTMANN. On nasal headache and nasal neurasthenia. *Deutsche med. Wochenschr.*, 1907, No. 18.

583. SHOLLY, A. I. V. Presence of diphtheria bacilli in apparently normal throats. *Jour. Infectious Diseases*, June 15, 1907.

584. BROWN, PHILIP K. Remote effects of tonsillar infection. *Jour. Am. Med. Assn.*, June 15, 1907.

585. DAVIS, DAVID J. Bacteriology of the respiratory tract with especial reference to influenza bacilli. *Jour. Am. Med. Assn.*, May 11, 1907.

586. FRIESNER, I. Unrecognized diphtheria in children. *N. Y. Med. Jour.*, May 11, 1907.

587. ROBERTS, JAY G. A new nasal dressing. *Jour. Am. Med. Assn.*, April 13, 1907.

588. BROWN, RICHARD H. A guarded burr for septal resections. *Laryngoscope*, April, 1907.

581. GUTMANN. *External eye diseases in their relation to nasal affections.*

If the nasal lachrymal duct ends under the anterior extremity of the inferior turbinate with a wide, well defined opening, the inflammatory products from the nose may extend to the conjunctiva and conjunctivitis may be associated with acute rhinitis. If the termination of this duct extends somewhat beyond the ostium of the bony duct in the nasal mucous membrane, the so-called valve of Hasneri, which is situated on the medial side, may act like a flap and prevent conjunctivitis but may cause lachrymation. Not infrequently

sensory and vasomotor reflex neuroses of the eye may originate in a diseased nose and be cured by appropriate treatment (correction of hypertrophied nasal mucous membrane, spines, spurs, or deviations of the nasal septum, adhesions, etc.). As regards the bacteria of the nose, though they may extend to the conjunctiva by way of the nasal lachrymal duct, they are much more apt to be conveyed in other ways, as by the hands, towels, etc. Examinations in the eye clinic and in the ear clinic in Berlin have shown that in 100 patients with eczema of the conjunctiva and cornea, 93 suffered from a nasal affection which was chronic in 81. Among the nasal affections, adenoid vegetations were the most frequent, occurring in 50%. In chronic conjunctivitis, chronic rhinitis with spurs or deviations of the septum was most frequent. The conditions in dacryocystitis are similar, although here the purulent inflammations of the nasal mucous membrane and of the accessory cavities play an important rôle. It is striking that of these patients 79% were females, while 21% were males. In those suffering from trachoma, 60% of the patients had a chronic nasal affection. The simultaneous presence of tuberculosis of the conjunctiva and of the nasal mucous membrane was observed, but not often enough to decide the question which was the primary disease. Finally the author mentions the coincidence of the occurrence of pemphigus of the conjunctiva and nasal mucous membrane, but remarks that its association was probably accidental.

NOLTENIUS.

582. HARTMANN. *On nasal headache and nasal neurasthenia.*

Hartmann states that Peritz and especially Norström frequently noted that chronic inflammation of the muscles of the neck (sterno-cleido-mastoid, trapezius, splenius), especially when their attachments to the skull are affected, frequently cause severe headache of a migrainal character, which occasionally is rapidly recovered from through massage (Norström), injections of salt solution (Peritz), or faradization (Hartmann). More frequently insufficient nasal respiration causes headache and neurasthenia. In children adenoid vegetations are the principal factors, while in adults, conditions of swelling of the mucous membrane, thickening of

the nasal septum, arrow structure of the nose, depressed nostrils, occasionally disease of the nasal sinuses, rarely polypi, are the chief causes. Depressed nostrils are corrected by Feldbausch's dilator. In most of the other cases appropriate surgical treatment is indicated. NOLTENIUS.

583. SHOLLY, A. I. v. *Presence of diphtheria bacilli in apparently normal throats.*

Diphtheria-like organisms are found in a certain number of normal throats even when exposure to infection of diphtheria is not traceable. One-third of the organisms isolated from the throats of such persons are virulent and their carriers a source of danger. Virulent bacilli are found four times as often in healthy persons exposed as in those not exposed to the infection. CLEMENS.

584. BROWN, PHILIP K. *Remote effects of tonsillar infection.*

The tonsil as a source of infection for heart disease has been well shown. The writer has observed recurrent endocarditis and muscular rheumatism occurring in certain of his old patients, and he considers that continued slight fever in children is probably a common result in tonsillar disease, at least in the region where he resides. Unusual complications of pericarditis, pneumonia, and lung abscess are reported. Nephritis without rheumatism is commoner than is usually supposed and occurred four times in his cases. The connection established between the tonsillar cervical route and lung tuberculosis is being more widely recognized. CLEMENS.

585. DAVIS, DAVID J. *Bacteriology of the respiratory tract, with especial reference to influenza bacilli.*

The experiments were undertaken to determine the frequency of occurrence of influenza-like bacteria in the sputa of persons afflicted with various infectious diseases. In 68 cases of whooping-cough influenza-like bacilli were isolated 61 times; in 23 cases of measles the bacilli were isolated 13 times; in 11 cases of varicella the bacilli were isolated 7 times; in 3 cases of epidemic meningitis the bacilli were found once, and in 12 cases of bronchitis 8 times. Otitis complicating

infectious diseases is due to a variety of organisms, of which the influenza bacilli may be one, but organisms of the streptococcus and diphtheria group are more frequently responsible.

CLEMENS.

586. FRIESNER, I. *Unrecognized diphtheria in children.*

Two illustrative cases are given in detail to show the importance of regular and careful examination of the nose in children where the condition of so-called "cold in the head" exists. In the early stages the examination reveals an acutely inflamed mucosa, but later, more or less typical diphtheritic membrane develops. A careful bacteriological examination should be undertaken in all suspected cases.

CLEMENS.

587. ROBERTS, JAY G. *A new nasal dressing.*

Two splints are cut from a sheet of paraffine conforming in shape to the Simpson nasal tampon but about $\frac{5}{8}$ of an inch longer. The tampon is placed between the two strips of paraffine, to which it is cemented by means of aristol-collodion. Any desired thickness may be secured by using the different thicknesses of the Simpson tampon. After being placed in position the moisture causes the cotton to swell and the paraffine is forced against the septum and outer wall of the nasal cavity, controlling hemorrhage and making an ideal non-irritating, protective dressing. The tampon can be removed *en masse* without pain, there being no adhesion.

CLEMENS.

588. BROWN, RICHARD H. *A guarded burr for septal resections.*

The instrument consists of a guarded drill or burr running in a steel-tube sheath which fits on a White dental handle. The guards can be arranged to project beyond either side of the tip of the drill to protect the membrane and to act as guides as well.

CLEMENS.

b.—OZÆNA.

589. OKUNEW. A case of symmetrical atrophy of the skin and submucous tissue of the sides of the nose in ozæna. *Russische Monatsschr. f. Ohrenheilk.*, etc., April, 1907.

589. OKUNEW. *A case of symmetrical atrophy of the skin and submucous tissue of the sides of the nose in ozæna.*

In a patient suffering from ozæna for many years, the author observed symmetrical triangular depressions about the size of the tip of the little finger, on the sides of the cartilaginous portion of the nose near the junction with the bony portion, and situated in the substance of the cartilage. The skin and submucous tissue in these places were markedly atrophied. This was probably due to a tropho-neurosis of the cutaneous terminations of the ethmoidal nerves. The depressions were corrected by paraffine injections and the shape of the nose was restored.

SACHER.

C.—TUMORS.

590. SCHMIDT. *A bleeding polyp on the lower turbinate.* *Arch. f. Laryngol.*, xix., Part 3.

591. CITELLI. *A case of melanosarcoma of the nasal mucous membrane.* *Arch. intern. d'otol.*, etc., xxiii., No. 3.

592. DENKER. *On the operation of malignant tumors of the nose.* *Arch. f. Laryngol.*, xix., Part 3.

590. SCHMIDT. *A bleeding polyp on the lower turbinate.*

This tumor was as large as a pea, bluish-red in color, and situated on the right lower turbinate. Microscopic examination showed the tumor to consist of a great many blood-vessels which were separated from one another by connective tissue.

VON EICKEN.

591. CITELLI. *A case of melanosarcoma of the nasal mucous membrane.*

The melanosarcoma in this patient, sixty-eight years old, was situated in the region of the middle turbinate, and had extended into the orbit and antrum. No operation was done. Death with symptoms of meningitis two years after the beginning of the disease. Microscopic examination confirmed the diagnosis of melanosarcoma. The statement that the nasal mucous membrane is always free from pigment is not correct.

OPPIKOFER.

592. DENKER. *On the operation of malignant tumors of the nose.*

Report of two cases of malignant tumors which were operated upon after Denker's method. The first recovered

and there has been no relapse up to seven months after operation. The second case died of meningitis. The operation of Denker enables the field of operation to be freely exposed and has the advantage of less danger of aspiration pneumonia and the absence of every disfigurement.

VON EICKEN.

d.—NASAL SEPTUM.

593. ANTON. Partial congenital atrophy of the nasal mucous membrane. A contribution to the etiology of perforation of the septum. *Prag. med. Wochenschr.*, 1907, No. 21.

594. VAN DEN WILDENBERG. A new speculum for intranasal resections. *Arch. intern. d'otol.*, xxiii., No. 3.

593. ANTON. *Partial congenital atrophy of the nasal mucous membrane. A contribution to the etiology of perforation of the septum.*

In the examination of 130 cadavers of children Anton found three cases of congenital partial atrophy of the nasal mucous membrane in the anterior part of the nasal septum and believes that this atrophy can be held responsible in many cases for perforations of the septum. HARTMANN.

594. VAN DEN WILDENBERG. *A new speculum for intranasal resections.*

For the submucous resection of the septum the author gives a picture and description of a nasal speculum which enables one to observe the detachment of the mucous membrane and cartilage from the floor of the nose. The short branch lifts the soft parts of the nose from the septum and the long branch is placed between the detached mucous membrane and the exposed cartilage. OPPIKOEFER.

e.—ACCESSORY CAVITIES.

595. FISH, H. MANNING. A study of optic neuritis in connection with nasal accessory-sinus disease. *British Med. Jour.*, 1907, ii., p. 1218.

596. SCHADLE, J. E. Antral sinusitis as an etiological factor in the production of hay fever. *Med. Record*, May 25, 1907.

597. HEIMERDINGER. On the pathological anatomy of the maxillary antrum. *Arch. f. Laryngol.*, xix., Part 3.

598. ALAGNA. On the pathological histology of chronic maxillary sinusitis. *Archivo italiano di otologia*, etc., xviii., Part 4.

599. GOLDMANN and KILLIAN. On the use of X-rays to determine the extent of nasal accessory sinuses and their diseases. *Beitr. zur klin. Chirurgie*, liv., Part 1.

600. D'ACUTOLO. On the incorrect diaphanoscopy of the antrum of Highmore. *Bollettino delle malattie dell' orecchio*, etc., xxv., No. 8.

601. COMPAIRE. A case of ethmoidal mucocele. *Arch. intern. d'otol.*, etc., xxiii., No. 3.

602. MALJUTIN. Cases of inflammation of the frontal sinus. *Russkij Wratsch.*, 1906, No. 51.

603. HAJEK. On operative methods in inflammation of the frontal sinus. *Wiener med. Wochenschr.*, 1907, No. 18.

604. STEPPETAT. On foreign bodies in the frontal sinus. *Arch. j. Laryngol.*, xix., Part 3.

605. LEVINGER. Pneumocele of the frontal sinus. *Arch. j. Laryngol.*, xix., Part 3.

606. SEVER, J. W. The Bier suction treatment of tuberculous sinuses. *Boston Med. and Surg. Jour.*, June 6, 1907.

607. MOSHER, H. P. A case of fatal meningitis after removal of the anterior end of the middle turbinate. *Boston Med. and Surg. Jour.*, May 30, 1907.

595. FISH, H. MANNING. A study of optic neuritis in connection with nasal accessory-sinus disease.

The importance of recognizing the fact that an affection of the optic nerve may be due to disease of any of the nasal sinuses has again been drawn attention to by Fish in an interesting and valuable paper.

Fish first discusses the various symptoms of sinusitis in its various forms. This paper is based on the examination of the nose and its accessory sinuses in a series of thirty-six consecutive cases of so-called idiopathic optic neuritis. Nasal accessory-sinus disease was found to be present twenty-six times. The direct causal relationship was shown in fifteen cases by the improvement in the ocular condition following drainage, and on a *priori* grounds the eleven remaining cases were also attributed to the same cause although the connection could not be demonstrated by any ocular improvement. The author emphasizes the importance of thorough examination of the sinuses in all cases of optic neuritis, especially if there is no definite lesion to account for the cause. Sinus disease as a cause of glaucoma is probably more frequent than hitherto supposed.

In chronic sinus disease with its ever-recurring exacerba-

tions, iridectomy often fails to cure glaucoma, and the eye goes on to gradual loss of function. Fish emphasizes that a negative nasal finding does not exclude sinus disease, and furthermore is convinced that accessory-sinus disease, in place of being a rare condition, is the most frequent cause of an affection of the optic nerve.

A table of the author's own cases and of other cases of optic neuritis due to sinusitis is appended. HUNTER TOD.

596. SCHADLE, J. E. *Antral sinusitis as an etiological factor in production of hay fever.*

The theory is advanced that catarrhal sinusitis of the antrum of Highmore is an important causative factor in the production of hay fever and of the commoner forms of catarrhal disease of the nasal tract. It is stated that where the ostium maxillare is of a normal size the affection does not occur, but where disease, malformation, or injury has made the antrum opening of sufficient size to admit germs to its interior, it does occur. Ninety-one cases have been treated by washing out the antrum and following it with an insufflation of thymol iodide. Only one failure followed, one was not benefited, and most were all cured of the hay fever in from one to two weeks and remained so. CLEMENS.

597. HEIMERDINGER. *On the pathological anatomy of the maxillary antrum.*

Report of a case of cholesteatoma and one of cholesterol cyst of the maxillary cavity, with microscopic examination. In the first case, a patient with ozæna, an opening had previously been made between the antrum and the nose. On again opening the cavity a large, onion-shaped, bulging mass was found which contained cholesterol crystals. The author raises the question whether this formation took its origin from the metaplastic epithelium of the ozæna.

Case 2 was that of a diseased maxillary cavity in which a cyst was found in the region of the maxillary foramen. Numerous cholesterol crystals and giant cells were present.

VON EICKEN.

598. ALAGNA. *On the pathological histology of chronic maxillary sinusitis.*

The pathological and histological conditions of the mucous membrane of the maxillary sinus in chronic empyema are described. After describing the pathological change in the epithelium, the subepithelial layer is described. This consists in changes in the blood-vessels and glands, through polypi and papillomatous growths, and in the presence of plasma cells and their degenerative forms. The literature is given.

RIMINI.

599. GOLDMANN and KILLIAN. *On the use of the X-rays to determine the extent of nasal accessory sinuses and their diseases.*

This paper is illustrated with sixteen Roentgen photographs, and discusses the diagnostic value of X-rays in determining the extent of the nasal cavities and in diseases of the ethmoid cells and maxillary antrum. Observations are made in sagittal section with the aid of Albers's diaphragm. The patient is placed with his forehead on the plate. The diaphragm is so arranged that the occipital protuberance occupies the centre of the aperture. The duration of exposure varies from $1\frac{1}{2}$ to 2 minutes with a soft or semifluid tube. It can be definitely determined whether any frontal sinus is present, as the configuration of the frontal sinus and its size can be well made out. From a certain veiling of the picture, disease of the frontal sinus, ethmoid cells, or maxillary sinus can be determined.

HARTMANN.

600. D'ACUTOLO. *On the incorrect diaphanoscopy of the antrum of Highmore.*

The author transilluminates the maxillary sinus with Vohsen's lamp from the outside, placing it against the lower orbital edge. In a normal sinus the hard palate and the molar portion of the alveolar processes on the same side are light. This method of transillumination of the antrum of Highmore offers, according to the author, a number of advantages.

RIMINI.

601. COMPAIRED. *A case of ethmoidal mucocele.*

A man, nineteen years of age, suffered from a right-sided mucocele of the ethmoid cells. Of interest is the rapid growth and the size of the mucocele.

OPPIKOFEK.

602. MALJUTIN. *Cases of inflammation of the frontal sinus.*

Two cases are described. In the first, during the operation, a very unusual anomaly was found, namely, absence of the posterior wall of the frontal sinus. In the second case, which was one of syphilitic affection of the frontal sinus, the process extended to the less yielding anterior wall, while the posterior wall was unaffected.

SACHER.

603. HAJEK. *On operative methods in inflammation of the frontal sinus.*

This is an address before laryngologists and ophthalmologists in which the various methods of operating are described and Kuhnt's method is recommended in cases of uncomplicated acute empyema. The author furthermore describes his modification of Killian's operation. In the more difficult cases he separates the soft parts from the orbit completely, so that the lower wall of the frontal sinus is freely exposed. Drainage of the nasal cavity then can be accomplished from the ethmoid. Of the nasal process only the posterior margin is removed. Seven cases have been operated upon according to this method. Notwithstanding the detachment of the trochlea, disturbances of vision and of the eye muscles disappeared eight days after operation.

WANNER.

604. STEPPETAT. *On foreign bodies in the frontal sinus.*

About sixty small pieces of porcelain were removed from the frontal sinus of a patient. Four years previously a coffee cup had been thrown against the patient's head, at which time the foreign bodies penetrated the sinus but gave no symptoms. The subsequent onset of pain made the operation necessary.

VON EICKEN.

605. LEVINGER. *Pneumocèle of the frontal sinus.*

After operation on the frontal sinus according to Killian there was, on blowing the nose, a marked protrusion of the soft parts and cutaneous emphysema. At the second operation the scar tissue in the region and the flap of mucous membrane having been curetted, healing followed.

VON EICKEN.

606. SEVER, J. W. *The Bier suction treatment of tuberculous sinuses.*

Sixteen cases are here reported treated by this method combined with compression, and eight of this number were either wholly healed or improved; in five the conditions were not improved locally but there was a distinct gain in weight and color index; three lost ground to such an extent treatment had to be discontinued. Cases of long standing were not as greatly benefited as those of a shorter period of time. This treatment is recommended as a routine measure in every case of sinus disease.

CLEMENS.

607. MOSHER, H. P. *A case of fatal meningitis after removal of the anterior end of the middle turbinate.*

The operation was performed in the usual way to aid drainage in a case of suppuration existing for several years. After thorough cleansing, the middle meatus was packed with sterile gauze which was removed the following morning and the antrum carefully syringed. At this time the case complained of severe frontal headache followed later by severe mental symptoms. The frontal sinus was opened and found full of pus although no communication with the cerebral cavity could be located. A few days later, the patient died. The operator is of the opinion that the nasal packing walled back the pus and infected the meninges through the cribriform plate.

CLEMENS.

f.—OTHER DISEASES OF THE NOSE.

608. AVELLIS. *On personal observations in the treatment of hay fever.* *Münchn. med. Wochenschr.*, 1907, No. 11.

609. HEYMANN. *Contribution to the study of hay fever.* *Arch. intern. d'otol.*, etc., xxiii., No. 3.

610. BAERWALD. *Alpine hay-fever stations.* *Deutsche med. Wochenschr.*, 1907, No. 17.

611. BOESSER. *Treatment of asthma due to hay fever.* *Deutsche med. Wochenschr.*, 1907, No. 25.

612. BERLINER. *Therapeutic indications in nervous affections.* *Wiener klin. Rundschau*, 1907, No. 25.

613. MELZI. *An aberrant tooth in the right nasal cavity.* *Arch. intern. d'otol.*, etc., xxiii., No. 3.

614. PORAS. *A case of primary lupus of the mucous membrane.* *Arch. f. Laryngol.*, xix., Part 3.

615. STREIT. **Further conclusions on scleroma.** *Arch. f. Laryngol.*, xix., Part 3.

616. SCHLOSSER. **Successful operation on tumor of the hypophysis by way of the nose.** *Wiener klin. Wochenschr.*, 1907, No. 21.

608. AVELLIS. *On personal observations in the treatment of hay fever.*

In the period before the attacks the nose is treated every year with the galvano-cautery, and during the attacks pollantin or graminol is tried. Of advantage is Ritsert's rhinokulin, used as a powder or salve, either alone or in conjunction with the pollantin treatment. Only in the event of complication with asthma is it necessary to recommend a change of climate for the patient. SCHEIBE.

609. HEYMAN. *Contribution to the study of hay fever.*

In addition to the usual routine treatment Heymann recommends tablets of thyroid extract. Three patients who took this medicine for some time before the onset of the hay-fever period, remained free from the disease. In sixteen others there was an improvement. OPPIKOFER.

610. BAERWALD. *Alpine hay-fever stations.*

Baerwald, who himself is a very sensitive hay-fever patient, has observed that certain points in the high Alps, especially Pontresina, and the still more highly situated Bernina houses, are suitable places in which patients may pass the dangerous time of the flying of pollen. For those patients who suffer from nervous cardiac symptoms and who do not feel well in the high air of the Alps, Baerwald recommends Lenzerheide, which is 1500 metres high, while Arosa, which is somewhat higher, is not to be recommended. NOLTENIUS.

611. BOESSER. *Treatment of asthma due to hay fever.*

In addition to recommending corticin for the favorable action which it exerts on the erectile tissue of the nose, Boesser endorses atropin-corticin injections for their action on the engorged bronchial mucosa, claiming an early and permanent result in hay-fever asthma. NOLTENIUS.

612. BERLINER. *Therapeutic indications in nervous affections.*

Berliner found that if in nervous rhinitis and asthma the constant current is applied to a place on the septum situated posteriorly, and a second place 6cm from the nasal opening at the base of the septum, tickling, a tendency to sneeze, coughing, and increased secretion follow. In order to be successful in causing a diminution of symptoms the procedure must be followed for from twelve to fourteen days. A weak current is begun with, which is gradually increased to five milliamperes. In vasomotor rhinitis Berliner recommends a nasal salve, "rhisan," which is a combination of athrolen and ung. dericini.

WANNER.

613. MELZI. *An aberrant tooth in the right nasal cavity.*

In a child with hereditary syphilis a tooth projected into the right lower nasal opening. In the superior maxillary the right middle incisor was missing.

OPPIKOFER.

614. PORAS. *A case of primary lupus of the mucous membrane.*

Without any evidence of lupus externally, there were found the characteristic changes of lupus in the mucous membrane of the nose, tonsils, uvula, epiglottis, and right arytenoid.

VON EICKEN.

615. STREIT. *Further conclusions on scleroma.*

The importance of histological examination for the proper diagnosis of scleroma is emphasized. The differential diagnosis between Friedländer bacillus and scleroma bacillus is not yet possible with our present methods. It is not yet possible to assert that the so-called scleroma bacillus is the sole exciter of scleromatous processes. It is, in fact, very probable that the invasion of the tissues by the scleroma bacillus causes the hyperplastic stages of the disease.

VON EICKEN.

616. SCHLOSSER. *Successful operation on tumor of the hypophysis by way of the nose.*

Schlosser presents the case of a patient, thirty years of age, in whom eight weeks previously he had performed a partial extirpation of a tumor of the hypophysis with good result.

The patient suffered for seven years with excruciating headache, and in addition for two years from anemia and loss of hair; for one year from bi-temporal hemianopsia. The diagnosis was verified by X-ray, which showed a widening of the sella turcica to the capacity of a large nut. The enlargement of the sella turcica in such cases may be of a threefold nature, —without change in the entrance, a widening of the same, or a combination of both. The first are suitable for operation, the second are not operable, while in the third, decision is difficult.

The operation is performed as follows: After detaching the entire nose, the turbinates and septum are excised, and the inner wall of the antrum of Highmore and the orbit near to the optic foramen, and a part of the nasal process of the left superior maxillary, are removed; the ethmoid cells and sphenoid cavity are now opened. In order to be able to judge correctly, Schlosser had previously measured in an X-ray picture the distance between the bony root of the nose and the anterior wall of the sella turcica; at exactly this distance (5.3cm) there was a bony lamina which could be easily broken through. The tumor which presented after incision into the dura was removed in layers with moderate hemorrhage. The cavity in the sella turcica was packed with gauze saturated with balsam of Peru. Histologically the tumor proved to be an adenoa. No symptoms of any disturbance following the loss of the hypophysis were observed. As there was no particular hemorrhage even during the clearing out of the nose, and as no meningitis followed, the author does not consider the method particularly difficult. After a time there appeared to be an increase in growth.

WANNER.

g.—NASO-PHARYNX.

617. FITZWILLIAM, DUNCAN C. L. Suppuration in the region of the pharynx. *The Practitioner*, lxxix., 1907, p. 811.

618. JANQUET. Two cases of naso-pharyngeal polypi operated upon by different methods. *La presse oto-laryngologique*, 1907, Part 7.

619. FULLERTON, ROBERT. Teratoma arising from the right tonsillar region. *British Med. Jour.*, 1907, ii., p. 963.

620. WORTHINGTON, T. C. A simple method of excision of the faucial tonsil. *Jour. Am. Med. Assn.*, May 25, 1907.

617. FITZWILLIAM, DUNCAN C. L. *Suppuration in the region of the pharynx.*

In this paper, based on extensive practical experience, and which is worthy of perusal in its original form, Fitzwilliam considers the miscellaneous abscesses found in the region of the pharynx, and endeavors to draw a sharp distinction between each on anatomical, pathological, and clinical grounds; and especially directs attention to the too little recognized form of suppuration between the mucous membrane and the pharyngeal fascia, to which he applies the term post-adenoid abscess.

The cases are divided into the following groups:

1. *Quinsy* or suppuration in or around the tonsil. In the latter situation the abscess lies chiefly in the soft palate and either palatal or peritonsillar abscess is a better term to apply. The pus is always superficial to the pharyngeal aponeurosis.

2. *Retropharyngeal abscess* is the name here given to suppuration which starts in the retropharyngeal space. This variety lies wholly outside the pharyngeal walls between the bucco-pharyngeal aponeurosis and the prevertebral layer of the deep cervical fascia.

3. *Post-adenoid suppuration* lies between the lymphoid tissue in the mucous membrane and the pharyngeal aponeurosis.

4. *Suppuration or caseation in the deep cervical glands*, lying in relation to the carotid sheath, may extend inwards to the lateral pharyngeal wall.

5. *A cold abscess due to spinal caries* lies behind the prevertebral layer of the deep cervical fascia.

A clear account is given of the etiology, diagnosis, and treatment of these several conditions. In thirty-two cases of retropharyngeal abscess, it was situated only four times in the middle line. This is presumably due to the lateral position of the lymphatic glands and to there being more room in this region for the accumulation of fluid. Fitzwilliam doubts if an "acute" retropharyngeal abscess ever exists, but considers the condition is frequently overlooked in its earlier stages, being only first noticed when the more serious symptoms of dyspnoea and dysphagia occur. An

important point in diagnosis is the absence of rigidity of the neck which at once differentiates the condition from an abscess due to spinal caries. The possibility of a fatal issue suddenly occurring from the bursting of a large abscess during sleep is, according to Fitzwilliam, practically unknown; even if the case be left to nature, rupture of the abscess will take place gradually through one or more small openings rather than by sudden evacuation of its contents. Post-adenoid abscess is of rare occurrence and may be considered analogous to suppuration occurring between the lymphoid tissue of the tonsil and pharyngeal aponeurosis. The symptoms, in addition to those associated with adenoids, are a recent sore throat, rapid increase of the nasal obstruction, and enlargement of the glands below the angle of the jaw. On examination a characteristic, firm, cystic swelling may be felt, covered with adenoid growth, and feeling quite different from the ordinary soft sensation of adenoids. The abscess is rarely of any great size and is situated in the middle line, but may extend forward on to the roof of the naso-pharynx; a position never assumed by a true retropharyngeal abscess. With regard to treatment, incision through the mouth is advocated for quinsy, retropharyngeal and post-adenoid abscess, care being taken that the incision is sufficiently adequate to prevent accumulation of the purulent contents. If the abscess is due to suppuration of the cervical glands or to spinal caries, it must be opened by an external incision.

HUNTER TOD.

618. JANQUET. *Two cases of naso-pharyngeal polypi operated upon by different methods.*

One tumor was removed after resection of the facial bones, the other by the natural ways with the help of the curette. The author claims that the electrolytic method is not advisable in cases where celerity is an object, as it is very slow and requires a great many sittings. The galvano-cautery also requires much time and is dangerous as the crusts may prove a source of infection and hemorrhage. Rapid removal with curette by the natural passages seems to be the best method, especially if the tumors can be reached well. It is not possible yet to suggest a method that will be suitable for

every case. Each tumor must be carefully examined therefore and treated accordingly. BRANDT.

619. FULLERTON, ROBERT. *Teratoma arising from the right tonsillar region.*

A large, fleshy growth, apparently arising from the right tonsil and extending across the oropharynx until almost in contact with the left side of the fauces, was removed by operation. Eight months later there was no recurrence. The nature of the tumor was doubtful; in parts resembling a round- and spindle-celled sarcoma, in other parts a fibromyoma. From the variety of the structure and from the presence of large cells in a matrix resembling cartilage, the tumor was considered to be a degenerated teratoma. HUNTER TOD.

620. WORTHINGTON, T. C. *A simple method of excision of the faucial tonsil.*

The simplicity consists in the use of the Seiler knife, which is double-edged, curved on the flat, and devised for septal work. The patient holds the tongue depressor, the extreme upper part of the tonsil is seized with a Pyncheon forceps and drawn downward and forward, and the attachments to the fossa are severed with the knife. The tonsil is then seized at a lower point and pulled on lightly while the knife is drawn firmly down its length just within the anterior pillar, dividing the triangular fold and disclosing the glandular tissue within.

CLEMENS.

PALATE, PHARYNX, AND BUCCAL CAVITY.

621. PONTI. *Adenocarcinoma of the soft and hard palate. La pratica oto-rino-laryngoiatrica*, vii., Part 3.

622. SWERSHEWSKI. *Hard chancre of the tonsils. Medizinskoje Obosrenje*, 1906, No. 22.

623. HAMM and TORHORST. *On the pathology of pharyngeal keratosis with especial regard to the bacteriology. Arch. f. Laryngol.*, xix., Part 3.

624. WOLF. *Rare localization of mycosis leptothrix. Arch. f. Laryngol.*, xix., Part 3.

625. SOMMER. *Lipoma of the tonsil. Arch. f. Laryngol.*, xix., Part 3.

626. SCHEIER. *Diseases of the mouth in glassblowers. Arch. f. Laryngol.*, xix., Part 3.

621. PONTI. *Adenocarcinoma of the soft and hard palate. Report of a case with histological examination. The*

various tumors which occur on the soft and hard palate are mentioned.

RIMINI.

622. SWERSHEWSKI. *Hard chancre of the tonsils.*

The author describes seventeen cases of atypical syphilitic infections of the tonsils. Characteristic of the infections were: 1. The one-sided localization of the disease; 2. One-sided enlargement and hardening of the lymph-glands; 3. Hard floor and border of the ulcer; 4. Long duration of the disease.

SACHER.

623. HAMM and TORHORRT. *On the pathology of pharyngeal keratosis with especial regard to the bacteriology.*

The authors regard the capsulated bacillus which they have discovered as the cause of the disease, which seems to be confirmed by the results of agglutination. The capsulated bacilli show an extremely high animal pathogenesis. Treatment consists in the mechanical removal of the plaques, and the application of glycerinated iodine.

VON EICKEN.

624. WOLF. *Rare localization of mycosis leptothrix.*

The considerably enlarged pharyngeal tonsil was covered with small and large plaques, which were also present in Rosenmüller's fossa.

VON EICKEN.

625. SOMMER. *Lipoma of the tonsil.*

Microscopic description of the tumor, which was yellowish white in color, about the size of a hazel nut, and was removed from the upper pole of the right tonsil.

VON EICKEN.

626. SCHEIER. *Diseases of the mouth in glassblowers.*

Scheier examined numerous glassblowers and in 6% of them found dilatation of Stenson's duct. The cheeks were often distended in balloon formation so that emphysema of the cheeks was sometimes noted. The mucous membrane of the cheeks often showed grayish-white plaque-like thickenings. The incisor teeth are colored dirty gray and are ground down from use. The lips often show fissures and cracks. The circumference of the neck is increased through venous congestion. The author draws attention to the great danger of the spread of syphilis among glassblowers because of the passing of the mouthpiece from mouth to mouth, and makes suggestions for overcoming this evil.

VON EICKEN.

BOOK REVIEWS.

I.—**Principles and Practice of Modern Otology.** By Dr. J. F. BARNHILL, Professor of Otology, Indiana University School of Medicine, and Dr. E. de W. WALES, Associate Professor of Otology, Indiana University School of Medicine. 575 pages. 305 illustrations. W. B. Saunders Company, Philadelphia and London. 1907. Price, \$5.50 net.

The authors in writing this book have kept the following objects in view as stated in the preface: 1. To modernize the subject; 2. To correct certain traditional beliefs; 3. To advocate the earliest possible prophylaxis or treatment; 4. To emphasize the importance of a thorough examination and a definite diagnosis as a basis for rational treatment; 5. To thoroughly illustrate the text.

They have admirably succeeded in their task and have furnished an excellent text-book, the best of the larger Otolgies in English. Dr. Barnhill is responsible for the greater part of the book; the chapters on anatomy, physiology, and bacteriology are contributed by Dr. Wales. A. K.

II.—**A Text-book of the Diseases of the Nose and Throat.** By Dr. D. BRADEN KYLE, Professor of Laryngology and Rhinology, Jefferson Medical College. 797 pages. 219 illustrations. Fourth edition. W. B. Saunders Company, Philadelphia and London. 1907. Price \$4.00 net.

In this new fourth edition many new articles have been added and many chapters have been re-written. The book has not only been brought up to date but improved and should continue to enjoy the favor which it has deservedly won for itself. A. K.

III.—**Diseases of the Nose and Throat.** By HERBERT

TILLEY, Surgeon to the Ear and Throat Department, University College Hospital, etc. 539 pages. 126 illustrations. London: H. K. Lewis, 136 Gower Street, W. C. 1908. Price 14 shillings net.

This is a brief and practical treatise on the diseases of the nose and throat, which can be recommended as a guide and an introduction to the study of this important specialty.

A. K.

IV.—**The Labyrinth of Animals.** By ALBERT A. GRAY, Aural Surgeon to the Victoria Infirmary, Glasgow. Volume II. London: J. & A. Churchill, 1908. (P. Blakiston's Son & Company, Philadelphia.) Price \$10.00 net.

The second and final volume of this magnificent atlas has now appeared. The publication of this volume was assisted by the Carnegie Trust. The study of the mammalian labyrinth is concluded and the labyrinth of birds, reptiles, and amphibians is described. This is illustrated by forty-five plates for stereoscopic observation. Explanatory text accompanies each plate and there are chapters on the venous system of the labyrinth of mammals, and general remarks on the anatomy of the labyrinth of birds and of reptiles, with a table of measurements.

The labyrinth, which in late years has been foremost in general interest from a surgical, clinical, and physiological view-point, receives a notable contribution to the subject of its anatomy by the appearance of this atlas.

A. K.

ARCHIVES OF OTOLOGY.

SOME POINTS IN THE SURGICAL ANATOMY OF THE TEMPORAL BONE BEARING ON THE SPREAD AND CURE OF SUPPURATION.¹

(ILLUSTRATED BY A COLLECTION OF OVER 525 TEMPORAL
BONES.)

By ARTHUR H. CHEATLE, F.R.C.S., LONDON.

(*With eight illustrations on Text-Plates X-XIII.*)

WHEN I received the great honor of an invitation from your President I accepted at once with pleasure, which on quiet reflection became tinged with the apprehension that I should fail to interest you. My sole claim to your attention is the collection of bones which I have brought with me, and I rely on the fascination which the temporal bone possesses with its many and important variations to relieve me from the apprehension I have expressed.

The collection of over 525 normal bones begins at the fifth month of foetal life, and represents, often with reduplications, nearly every year of life up to the age of eighty years, and there are some above that age. The sex and age are given with the great majority up to No. 371; after that they are not known, but the specimens serve to show types and surgical anatomical peculiarities. They are mostly sectioned vertically through the antrum, mastoid process, and some part of the labyrinth.

¹ Address delivered before the Section on Otology, New York Academy of Medicine, May 25, 1908.

The catalogue I have had specially drawn up; at the end of it is a list of specimens, under headings which illustrate the points dealt with in the demonstration.

There are, no doubt, many points which I have not noted or have overlooked, and I shall be only too pleased to have my attention drawn to them or to make further sections which may be desired.

The anatomy of the temporal bone is, of course, the foundation of aural surgery. If the anatomical conditions were always regular half the fascination of the specialty would be gone.

The spread of suppuration depends largely on the type of bone affected, and it is, therefore, of the highest importance to know the possibilities when making a diagnosis or when operating.

I propose to deal with points in the anatomy of the bone bearing on the spread and cure of suppuration, and I will try to make the "dry bones live" with the help of lantern slides, craving your indulgence in speaking of matters which are perfectly well known to you.

If the temporal bone at birth be separated into its two main divisions, petrous and squamo-zygomatic, to which is attached the tympanic ring, the inner wall of the antrum is exposed above and behind the middle ear proper and is seen to be a regular and definite part of the middle-ear tract. This fact is easily demonstrated at the fifth month of foetal life, when the inner antral wall appears as a smooth-walled recess above and behind the incus. The antrum, then, is laid down as a part of the middle-ear tract in foetal life, and is not an outgrowth from what is ordinarily known as the middle ear. As the antrum is so regular in its formation it would be a curious thing if it were ever absent, and I may here state that I have yet to see a bone without it apart from congenital malformation. If the inner aspect of the posterior descending plate of the squamo-zygomatic portion be examined, its upper and back part, where it forms the

ILLUSTRATING DR. CHEATLE'S ARTICLE ON "SOME POINTS IN THE SURGICAL
ANATOMY OF THE TEMPORAL BONE BEARING ON THE SPREAD
AND CURE OF SUPPLURATION."

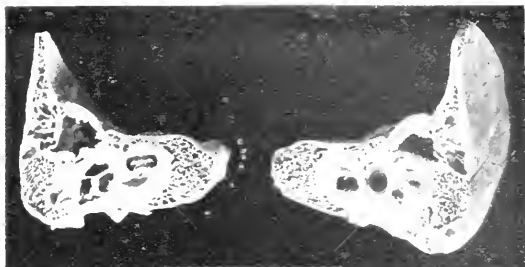


FIG. 1.—Left bone. Aged 6 months.

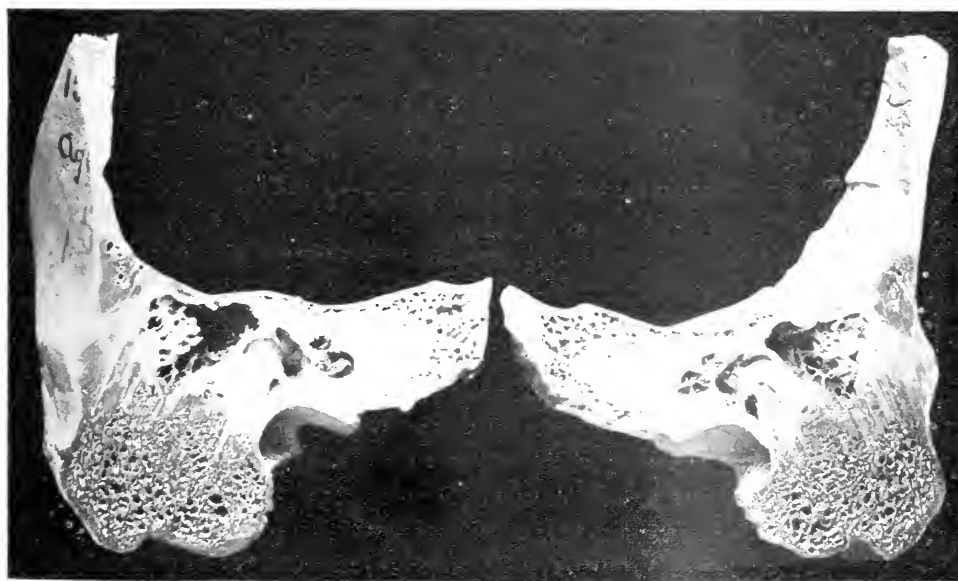


FIG. 2.—Right bone. Male. Aged 42 years.

outer wall of the antrum, is seen to be lined with a mass of fine cells having an inward direction. These cells are always present at birth and remain distinct from any cells which may form later in life. Even if the antrum is a mere slit in the adult they can always be seen and the cavity distinguished by their presence. It may be said that they are the most constant cells in the bone. They appear about the sixth month of foetal life and are well marked during the seventh and eighth months. Such is their regularity that one cannot but think that they must have some physiological purpose. It may be that they serve to increase the lining membrane area. Many years ago Arbuthnot Lane suggested that the antrum acted as a reservoir for fluid which lubricated the middle ear and its contents. In front of these cells the bone is smooth where it forms the outer attic wall, and also below and behind them where it overlaps the mastoid mass of the petrous and subsequently helps to form the mastoid process. The amount of overlapping varies considerably.

If a lateral vertical section be made through the antrum and mastoid mass in infancy the latter is seen to be most frequently diploëtic, but it is sometimes dense. The outer antral wall is composed of a thin outer layer of compact bone having the lining of fine cells, which may be called the "foetal cells." Separating the cavity of the antrum from the mastoid diploë is a thin layer of compact bone which is usually so well marked that the diploë can be scraped away, leaving the partition intact. (Fig. 1.)

As the infant begins to raise and move its head the mastoid process gradually forms for the attachment of the necessary muscles, and eventually consists of two parts, an upper non-projecting and a lower projecting portion which slopes upwards and backwards, the extent and character of the latter varying enormously; in some bones there is no free projecting part. That the process

forms only for the attachment of muscles and that any cells which may form do not possess any auditory function are strongly indicated by a case related by Purves Stewart (*Brain*, 1904, p. 89), in which the large neck muscles on one side were congenitally absent, with complete non-development of a mastoid process.

I have spoken of some anatomical details which I think are of importance in so far as they help us to understand some of the types of adult bones, which may be divided into:

TYPES OF TEMPORAL BONES.

1. *Infantile.*
2. *Cellular.*

1. *The infantile types* are those in which no invasion of the diploë by cells from the middle-ear tract has taken place.

- (i) Diploëtic, in which the mastoid mass is diploëtic.
- (ii) Dense, in which the mastoid mass is dense.
- (i) The diploëtic:

In this type, the condition seen most frequently in infancy of an outer antral wall composed of an outer layer of compact bone with an inner layer of cells, a diploëtic mastoid mass between which and the cavity of the antrum is a thin layer of compact bone, persists all through life but in an exaggerated degree. The outer compact layer of the outer antral wall and the overlapping part below the antrum become thicker and remain extremely dense. The "foetal cells" remain. The separating layer of compact bone between the cavity of the antrum and the mastoid mass becomes thicker and also remains extremely dense. The overlapping portion is often seen to be sharply marked off from the diploëtic mastoid mass, which increases in size as demanded by the muscles. (Fig. 2.)

In the collection this type forms about 20 per cent. of

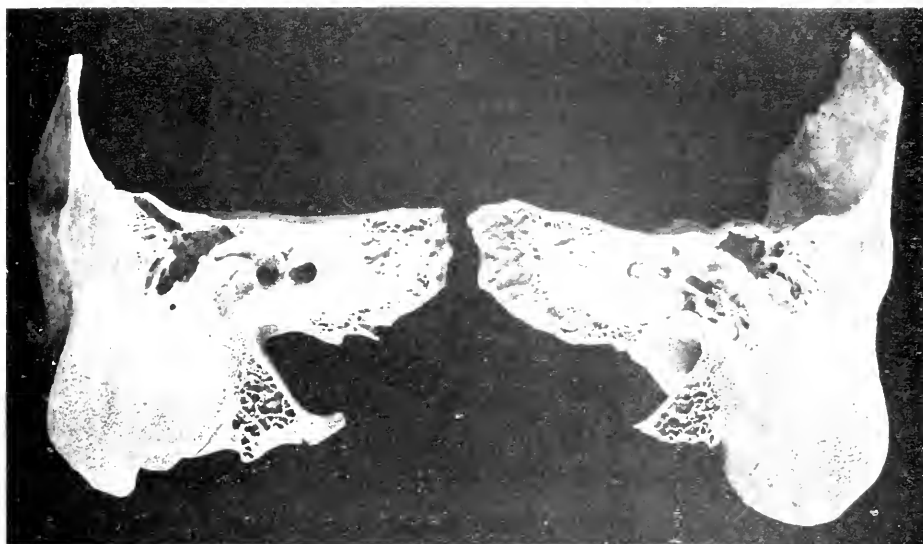


FIG. 3.—Right bone. Aged 1.

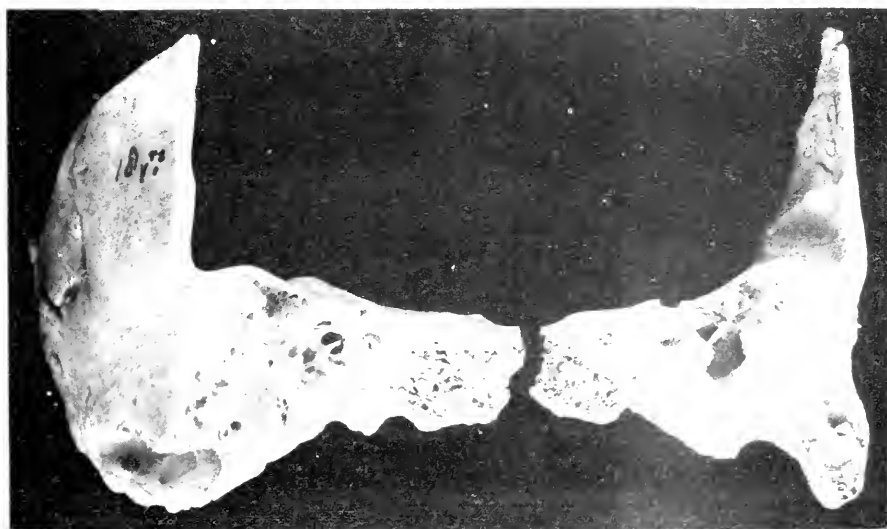


FIG. 4.—Right bone. Aged 18 years.

all normal bones above the age of five years, and it is represented in nearly every year of life.

In looking through these bones the absence of cells in other parts is remarkable. This dense condition of the outer antral wall is usually ascribed to osteosclerosis, but in the face of the frequent occurrence of the type in bones in which antral suppuration has not occurred, one cannot but think that the condition is a normal anatomical one.

In looking back, in my mind, over the cases in which I have performed the radical operation for chronic suppuration, it seems that this type has very frequently been met with, and I venture to suggest that the condition is not the result of chronic suppuration but is a factor in producing it. An acute inflammation in the antrum having been unable to find a vent to the surface through mastoid cells or outer antral wall has therefore remained pent up in the antrum, causing changes in and destruction of the lining membrane, with, perhaps, superficial caries of bone, causing a chronic discharge.

The antrum in this type may be large or small. It is sometimes, but by no means always, associated with a thin posterior wall which is translucent to the posterior fossa where the cerebellum or lateral sinus, or both, lie against it, as in the cellular type, and it seems to me that in many of the cases of the gravest intracranial complications due to acute or chronic disease this condition has been a distinct factor, for the disease, being unable to extend outwards or to attack the mastoid process, finds an easier path to the middle and posterior fossæ and to the semicircular canals, especially the outer one.

The deepest antrum occurs under these conditions, the outer antral wall in two specimens measuring three quarters of an inch.

The lateral sinus is more frequently forward and in its most exaggerated form than in the cellular types. In 71 bones in which I noted a forward sinus this type was

present in 40, and this is omitting those bones which have a few cells in the mastoid and a dense outer antral wall and, therefore, closely resemble the pure infantile type.

In one specimen the cerebellum pushes the posterior antral wall forward, causing the cavity to be narrowed antero-posteriorly.

The difficulty in operating on these bones is evident, and is much increased if the antrum is small and highly placed and a forward sinus is also present.

(ii) The dense:

Very rarely the mastoid mass is of great density in infancy, and so it may remain all through life, the condition of the outer antral wall remaining as in the diploëtic form. There are only seven specimens of this type in the collection. The surgical importance is precisely that of the more frequently occurring diploëtic form. (Fig. 3.)

The absence of cells in these infantile types is an added argument against the cells serving any auditory function.

2. *The cellular types.*

To clearly understand the possible distribution of cells throughout the bone it is necessary to study the diploëtic arrangement in infancy, for it may be stated broadly that *wherever diploë is present in early life there may cells take its place later on.*

The diploë can be studied by sectioning the infant bone in various directions and at different levels. The distribution is by no means regular in every bone but the possible conditions are the important ones to consider.

There is always a large mass of diploë internal to the bony labyrinth occupying the whole thickness of the bone. I shall always allude to it as the "internal diploë."

We have seen that the mastoid mass is, in the great majority of bones, diploëtic. This mass is continued:

Backwards: over the lateral sinus.

Backwards and downwards: under the lateral sinus.

Backwards and upwards: behind the antrum and into

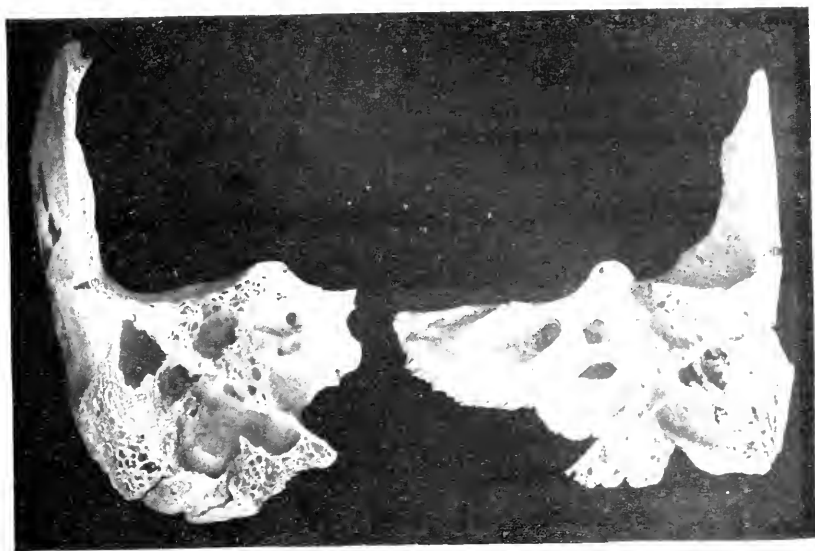


FIG. 5.—Right bone. Male. Aged 42 years.

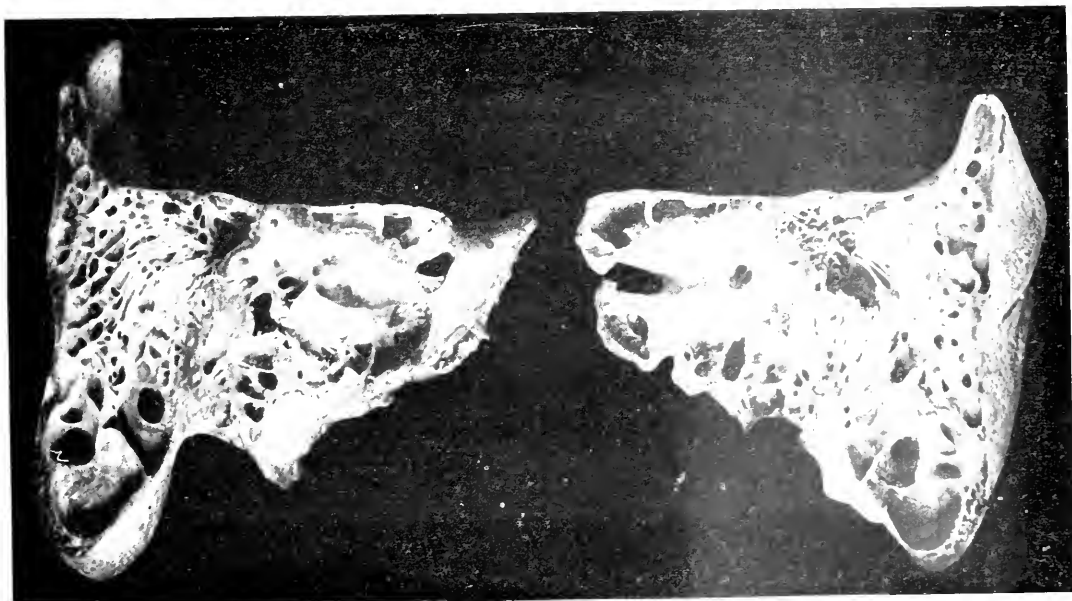


FIG. 6.—Left bone. Male. Aged 18 years.

the posterior wall of that cavity, and is continued along the posterior surface of the bone as a very thin layer, leaving a gap for the internal auditory meatus and the aqueductus vestibuli and becomes continuous with the "internal diploë." That of the posterior wall of the antrum becomes continuous with that forming the inner antral wall.

Inwards: up to the descending part of the facial nerve and sulcus jugularis; or it may pass internal to these structures under the bony labyrinth and middle ear, passing over the sulcus jugularis and joining the "internal diploë."

Inwards and downwards: under the sulcus jugularis up to the occipital diploë, from which it is separated by a thin layer of compact bone.

The inner antral wall in the angle between the external, superior, and posterior canals is diploëtic, and this diploë may be continued through the loop of the superior canal, to join the "internal diploë." A thin layer runs over the superior canal and winds round its anterior extremity, and is continued superiorly inwards to the "internal diploë."

Diploë may be present almost surrounding the canal for the internal carotid canal, passing under the cochlea and joining the "internal diploë."

Diploë is also seen in the ascending part of the squama, in the roof of the meatus, and in the zygoma.

The possibilities, then, of cellular formation are very great, and are sometimes taken full advantage of. A large amount of diploë may, as we have seen, remain all through life, or it may be invaded by cells or thinned out by the pressure, during growth, of surrounding structures. The latter process is very well seen in the mass of diploë behind and above the antrum.

Every cell in the bone, with the exception of the "petrous cell," which will be dealt with later on, has its origin in the middle-ear tract, mainly from the antrum,

and each is directly or indirectly in communication with that tract and with one another—a point of great import when considering the possible spread and perforation of infection and when operating on the bone.

The connection of cells can be proved by the filling of the cells or middle-ear tract with water under pressure by means of a syringe. There is a great fascination in doing this with a series of cellular bones and observing the emergence of the water at apparently impossible places.

The age at which the mastoid cells first appear cannot be absolutely fixed. As far as I can ascertain from my specimens the usual thing is for them to commence, if they are going to form at all, about the age of five years; but there is a specimen, aged two years, in which cells are well formed; and in the bone of a child, aged one year and seven months, the commencement of the invasion is well seen. The cells are often seen at seven and eight years, and are usually well marked at ten years or soon after. As a matter of fact it is impossible to say what may be the condition of the interior of a bone after the first year of life.

It may be asked, When do cells cease to form? In my opinion they cease to form in young adult life—that is, as soon as the individual attains full growth, after which no further change takes place. The same amount of cell formation is seen in the young adult as in late life.

In the following descriptions of the cellular types it will be seen that the diploë may be partly or wholly replaced by cells. I have not dealt with them on that pure anatomical basis, but have preferred to illustrate the most frequent types and some of their variations as being more interesting from a surgical point of view.

It will be seen that the condition of the outer antral wall is taken into consideration in each type.

There are three situations in the middle-ear tract from which the diploë may be invaded:

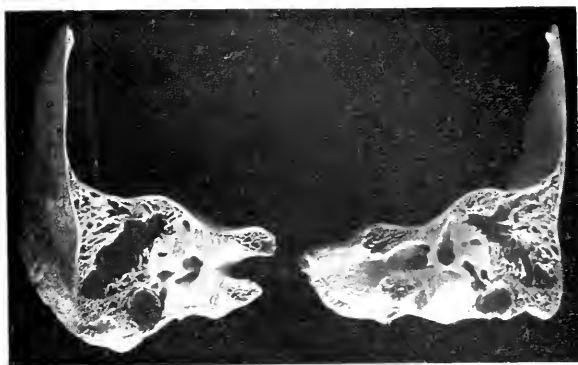


FIG. 7.—Right bone. Female. Aged 2 years.



FIG. 8.

- (A) From the antrum.
- (B) From the floor of the middle ear.
- (c) From the top of the inner wall of the middle ear.
- (A) Cells from the antrum:

The cells from the antrum may spread into the surrounding diploë from the floor and the outer, inner, and posterior walls, and along the line of the overlapping masto-squamosal suture.

(1) The outer antral wall may remain dense and cells form in the upper mastoid, sometimes along the line of the masto-squamosal suture only, the lower mastoid being diploëtic or dense. In the former case the line of division between the invading cells and the diploë is always well marked. This condition is closely allied to the pure diploëtic infantile type, and shares to a great extent its surgical importance.

(2) The outer antral wall may remain dense, and the cells extend throughout the mastoid process, but frequently with a rim of diploë at the extreme tip. Cellular mastoid processes of any form, in which diploë is completely absent, are comparatively uncommon; a thin rim is frequently to be seen at the extreme tip.

Rare variations of this type in the collection are:

(i) A narrow tortuous track with exceedingly dense walls passing throughout the process.

(ii) A narrow track of fine cells passing through the upper mastoid to a large cell or cells in the lower mastoid, the cell or cells having an extensive prolongation backward outside the lateral sinus, and over the digastric and occipital grooves where perforation into the neck might take place. (Fig. 4.)

So that a dense outer antral wall does not by any means always mean that cells are absent in the upper or lower mastoid, and care must be taken when operating that suppuration has not passed lower than the antrum.

(3) The outer antral wall may be cellular with cells in the upper mastoid, the lower mastoid being diploëtic

or dense. If there are cells between the outer compact layer of the outer antral wall and the inner layer of "foetal-cells" there are always cells in the upper mastoid. These invasion-cells, as I have before stated, have a coarse appearance and a perpendicular arrangement, and are usually well marked off from the "foetal cells," from which they probably are extensions.

Variations of this type in the collection are:

(i) A large cell, which might be mistaken for the antrum, in the outer antral wall immediately below the outer compact layer, with cells in the upper mastoid, the lower mastoid being diploëtic.

(ii) A large cell, which might be mistaken for the antrum, in the outer antral wall, communicating with coarse cells which pass downwards and inwards, internal to the mastoid process, and reach right down to the digastric fossa where the partition is very thin. These lower cells are bounded behind by a thin bony partition which forms the lateral sinus groove; they are also invading the occipital diploë. (Fig. 5.)

In this bone suppuration in the antrum would easily reach the neck without passing through the mastoid process. Luc and Urbantschitsch have published cases in which this condition probably existed, although I have seen one case of thrombosis of the lateral sinus in which an extra-dural abscess in the posterior fossa passed through the jugular foramen into the neck.

(iii) The outer antral wall and upper mastoid are cellular with one especially large cell coming to the surface at the extreme top of the inner aspect of the lower projecting part of the mastoid, forming another possible pathway for pus to reach the neck. The remainder of the process is diploëtic.

(4) Cells may be present in the outer antral wall and throughout the entire mastoid process, with or without a rim of diploë at the extreme tip.

In performing the radical operation in cases in which

the lower mastoid cells are involved, I think it is better to remove the whole projecting part instead of merely clearing it out; there is then subsequently no dependent part below the opening into the meatus.

For purposes of description further extension into the diploë may take place from the cells in:

- (i) The outer antral wall.
- (ii) The upper mastoid.
- (iii) The lower mastoid.

(i) From the outer antral wall the ascending part of the squama may be invaded upwards and forwards, or the cells may extend over the meatus and into the zygoma, or they may extend backwards and upwards behind the antrum where occasionally a specially large cell is seen and called by Elsworth "the accessory antrum," although in reality it is merely a large cell. This backward extension communicates with upward extending cells from the lower mastoid. This extension may join cells from the posterior antral wall and reach the posterior semicircular canal, or it may pass over the canal and run right up to and invade the "internal diploë," leaving a gap for the internal auditory meatus and the vestibular aqueduct. It may join with extensions from the inner antral wall and pass through the loop of, rarely over, the superior canal and again join the extension to the internal diploë.

(ii) The upper mastoid cells may extend backwards over the lateral sinus joining above any backward extension from the outer antral wall and any from below. They may extend inwards up to the descending part of the facial nerve and to the sulcus jugularis if that structure lies high; or they may pass farther inwards round the nerve and, if the sulcus lies low, under the semicircular canals, internal auditory meatus, middle ear, and vestibule, and over the sulcus to the "internal diploë," and even invade it. It is important to remember from a surgical point of view that the sulcus

jugularis does not always retain its position against the posterior canal and vestibule. The cells may pass downwards and inwards under the lateral sinus and sulcus jugularis, and reach the occipital diploë and even invade it.

(iii) The lower mastoid cells often attain a very large size either as one large cell or a series of cells, for there is more diploë to spread themselves out in. They may extend backwards and upwards, joining cells from the upper mastoid which pass over and under the lateral sinus. They may extend inwards over the digastric and occipital grooves, forming a pathway for pus to reach the neck.

(B) Cells in the floor of the middle ear may pass under the vestibule and cochlea running up to or invading the "internal diploë," or they may line the inner wall and floor of the Eustachian tube, sometimes extending inwards behind and below the carotid canal, and reaching the "internal diploë"; so that the internal carotid artery does not always lie in contact with the cochlea—an important thing to remember when operating on the latter.

(c) Cells from the top of the inner middle-ear wall may run parallel to and join the extension from the floor, and so reach the "internal diploë."

Very rarely cells may extend in all directions and practically invade all the diploë. In one specimen even the "internal diploë" is replaced by cells and nearly the entire labyrinth surrounded, and so is the carotid canal. In this specimen the cells replacing the "internal diploë" are large, for here, as in the mastoid diploë, there is more room for their formation. (Fig. 6.)

THE "PETROUS" CELL.

There is occasionally seen a large cell, lined with compact bone, below and internal to the mastoid diploë and

just behind the descending part of the facial nerve, which, indeed, sometimes runs through it before emerging at the stylo-mastoid foramen.

At the fifth and sixth months of foetal life a mass of cartilage occupies the anterior inferior aspect of the bone below and anterior to that from which the mastoid process is formed. As this cartilage becomes ossified the bone closes over to form the stylo-mastoid foramen, and leaves anteriorly this densely lined cell from which foramina open for the passage of vessels to the surrounding parts. It apparently forms in connection with the development of the facial, the chorda tympani, and the stapedius muscle canals. Sometimes there is an opening into the cell below and behind the stylo-mastoid foramen. The sinus tympani is sometimes in communication with it by a slit-like opening and sometimes appears to be part of it.

The cell must not be mistaken for one of the mastoid cells. (Fig. 7.)

Recesses in the Middle Ear.

The recesses seen in the middle ear are of importance as they may be filled with *débris* and require cleaning out when operating for chronic suppuration.

1. A recess is sometimes seen at the front part of the attic in front of the head of the malleus and above the canal for the tensor tympani. The facial nerve lies close to its inner wall.

2. A recess on each side of the pyramid on the posterior wall of the middle ear below the opening of the antrum, to the attic, is often seen.

They may be called the "external and internal pyramidal recesses"; the latter is known as the sinus tympani.

(i) The external pyramidal recess is not usually described, but a slight description of it was given by me

in the *Transactions of the Otological Society of Great Britain for 1900*, p. 45

If a foetal bone at the eighth month be examined, the recess is seen on the outer side of the pyramid lying immediately outside the descending part of the facial nerve. The recess often dips down, forming a pocket; this condition is due to the posterior part of the floor of the middle ear turning up and ending as a free border, the inner edge of which is attached to the outer side of the pyramid. This pocketing may be seen in the adult.

The recess may run right outside the facial nerve and communicate with cells farther out.

Occasionally a spicule of bone runs from the edge of the bony meatus to the pyramid across the opening of the recess, and is evidently meant as a support to the pyramid, as is the spicule which is so frequently seen passing from the inner side of the pyramid to the promontory. Occasionally the spicule is replaced by a ledge.

(ii) The internal pyramidal recess or sinus tympani varies exceedingly; it may be a shallow recess crossed at its upper part by the pyramid-supporting spicule of bone, which, by the way, may be double; or it may be much deeper, running right behind the facial nerve under the external canal and coming into relationship with the posterior semicircular canal. Often it runs right up to the outer wall of the vestibule, which may be translucent, below and behind the oval window. Its floor may be formed by a high sulcus jugularis, or it may dip down as a pocket well below its opening into the middle ear and abut on a low-lying sulcus jugularis, or run alongside its outer wall. A foramen is occasionally seen in the floor leading to the sulcus jugularis, evidently for the passage of a vein. As before stated, it sometimes communicates and apparently becomes part of the "petrous cell."

The recess, therefore, has very important relationships.

In many instances attempts to thoroughly clean it through its opening with instruments must result in injury to the facial nerve, and the question is whether the risk of infection spreading from it warrants the risk of facial paralysis. It might be just possible to pass a very fine bent probe through its opening and by that means to gauge its extent and direction, and if it is a large cavity it is possible to open it below the projecting loop of the external canal and behind the facial nerve.

Projection into the Roof of the Middle-Ear Tract of the Free Edge of the Underlying Squamous Portion of the Petro-squamosal Suture.

The roof of the middle-ear tract, especially of the antrum, is usually divided into an inner and outer part by the free edge of the squama at the petro-squamosal suture projecting into it.

Cells are often seen on each side of it, the inner ones often being hidden. It is therefore always necessary to remove it when operating in order to clean the inner part.

The Lateral Sinus.

In infancy the sinus lies in a horizontal manner below and behind the mastoid mass, being separated from it by dense diploëtic bone rendering infection unlikely below the age of six months.

As age advances it becomes more vertical, and as the intervening diploë becomes lost partly by the pressure of the intracranial structures, the sinus may come into closer relationship with the antrum and mastoid process; or the diploë may be invaded by cells, in which case the sinus usually remains far back. As we have seen, a forward sinus is more frequently seen in the infantile types than in the cellular.

No surgical reliance can be placed on the statement

that a right sinus is larger and more likely to be forward than a left one; for it may be quite small and far back on the right side and very large and forward on the left, in fact the largest and most forward sinus in the collection occurs on the left side. A forward sinus is not necessarily a large one.

When it is forward it may run right up to and groove the posterior antral wall, or it may dip in between the cavity of the antrum and the surface, but I have never seen it quite occupying the position of the suprameatal triangle, although very nearly. In one specimen it partly overlaps the antrum and is separated from the external surface just behind that cavity by a roughly circular patch of thin translucent bone.

It may run right up to the posterior meatal wall below the antrum or shut out its apex, especially if that cavity is highly placed. There is sometimes a thin track of diploë or cells in the upper mastoid running anteriorly or internally to the sinus and reaching a larger mass of diploë or cells in the lower mastoid.

There is no guide as to the position of the sinus except that the dark color may sometimes be seen through the bone, especially in children.

A very marked forward sinus is present in a child aged three years and in another aged seven years.

A large sinus does not necessarily mean that the jugular bulb and sulcus are also large, for if a large mastoid vein is present they may be much reduced in size as a result.

In one specimen a curious condition is present in the interior of the vertical part of the sinus; a vertical membranous septum, half an inch in length, divides the vessel into two parts. Such a septum is, fortunately, rare, for it might be very awkward in dealing with septic thrombosis. There is no reason why septa should not occur, for the sinus is developed from cavernous spaces in the same way as the longitudinal sinus in which they are more commonly seen.

The Mastoid Emissary Vein.

This vein is of importance as it sometimes shares in septic thrombosis of the lateral sinus and requires dealing with, and it is a nuisance sometimes when extending the bony wound to explore the cerebellum.

It is very variable; rarely it is absent. In size it varies from a thread to a pencil. It usually comes off from the sinus directly to enter its bony canal, through which it takes a curved course before opening behind the base of the process; often, however, it runs along the inner surface for some distance before entering the bone.

The point at which it comes off from the sinus varies; usually it is high up, sometimes it is low down.

It always adopts a curved course before emerging, as do all the veins coming from the base of the skull. The channel through the bone may be an inch in length.

The point of emergence also varies; the usual place is behind and below the base of the mastoid, but it may be much lower, in the back part of the digastric or occipital grooves or below and behind them.

Frequently it is double, either beginning as two vessels or beginning as one and dividing in some part of the long course, sometimes immediately, at others farther in, or at the actual point of emergence. The two external openings may be close together, or one may be high up and one low down.

The Sulcus Jugularis.

The sulcus may retain its infantile position, lying against the middle ear and bony labyrinth, or it may become separated from them by cells or by compact bone increasing to three-quarters of an inch in thickness. If it remains high it may push upwards, bulging up the floor of the middle ear, and form the floor of the sinus tympani. The roof of it is sometimes divided into two recesses. It may push outwards to the descending part

of the facial nerve, which may actually run through the outer wall, and come to about half an inch from the surface of the upper mastoid. It may reach to the mastoid cells, as has been seen.

On the posterior aspect of the bone it may reach up nearly as high as the posterior border lying under the aqueductus vestibuli and saccus endolymphaticus, and it may extend outwards almost reaching the lateral sinus groove.

It is curious how rarely infection spreads through the middle-ear floor to the jugular bulb, a remark which also applies to the internal carotid artery.

A very up-pushing sulcus need not necessarily mean a large one.

An important question is, how can it be reached in order to deal with an infected jugular bulb? There are three ways from a purely anatomical point of view:

- (1) Through the outer wall.
- (2) Through the posterior wall.
- (3) Through the postero-external angle.

(1) To reach it satisfactorily through the outer wall, the whole mastoid process, the floor of the meatus, and the intervening bone more internally must be removed. This is a very difficult procedure and must mean destruction of the facial nerve.

(2) To approach the posterior wall of the sulcus the patient should be turned on his face with the forehead resting on a separate support, and the head well flexed and a flap turned down behind the mastoid process so that the muscles can be detached until the posterior edge of the jugular foramen is reached. As a broad rule this would mean that the muscles and periosteum would have to be detached as far as a line drawn horizontally inwards from the posterior edge of the bony meatus. This line usually runs through the stylomastoid foramen and the posterior edge of the jugular foramen. To make more room the mastoid process could be entirely removed.

(3) The postero-external angle is perhaps the best point of attack. The head should be well flexed and turned away from the surgeon and the sinus followed down. Removal of the projecting part of the mastoid process will give more room.

The Petro-squamosal Sinus.

This sinus is of importance as being a possible carrier of infection either through the blood-stream or through the perivascular lymphatic spaces.

It runs along the petro-squamosal suture, sometimes deeply grooving the bone, and enters the lateral sinus by a valve-like opening. It may open anteriorly between the post-glenoid tubercle and the bony meatus, in the outer end of the Glasserian fissure, in the glenoid cavity, or in the zygoma; like all venous channels leaving the skull, it has a bend before it emerges on the surface.

It receives branches, having a meningeal covering, from the middle ear below, and from the meninges and temporo-sphenoidal lobe above.

I have not infrequently seen cases of infants dying with purulent meningitis, and at the autopsy the middle ear on the side affected has been found full of pus and with an intact membrane, and there is no doubt in my mind that the sinus and its branches have served as carriers. Dr. A. Cleveland, of Philadelphia, was the first, I think, to record a case of septic thrombosis of the sinus with spread to the lateral sinus (ARCH. OF OTOTOLOGY, vol. xxiv., p. 136).

In my opinion the sinus and its connection are also responsible for the temporo-sphenoidal abscess which forms in the substance of the lobe without direct extension of disease.

Instances in which Macewen's Triangle is Fallacious.

In the great majority of cases the triangle is a sure

guide, but we have seen that the lateral sinus may encroach on the posterior line and apex. The upper or base line may also be fallacious. The antrum may be wholly above it and finding the cavity may be difficult, especially if it is small and is associated with a forward sinus. The high condition is seen in both the infantile and cellular types, but in the former a forward sinus is more to be expected. The cavity may be only partly above the line—a condition which does not present much difficulty, as the lower part of the cavity is exposed through the triangle and a probe carefully used will tell the tale. There is no guide on the surface to warn us in either condition. A rare condition is for the antrum to be highly placed and yet the middle fossa dips down externally to it, forming a particularly annoying state of things. A high antrum is comparatively common.

More rarely—in only twelve bones in the collection—the middle fossa dips down externally to the superior semicircular canal, especially in hydrocephalic skulls, causing the triangle to lead to dura mater. This dipping down may occur immediately outside the superior canal, causing a low flat antrum, or the outer part of the roof of the antrum may be pushed down, causing a sloping narrow cavity.

The depression may occur outside the antrum, in which case the cavity may really correspond to the triangle, but the dura mater intervenes.

A forward sinus is seen in this condition but not to an extreme degree.

It can be seen in these bones that the posterior zygomatic line has a bulging appearance and that the bone below it has a marked inclination inwards. Such conditions are the only guides to an abnormal relation of the antrum to the triangle which I am aware of, and even these may be fallacious.

The moral to be drawn from all these variations is to operate as if they were expected.

The Suprameatal Spine.

The spine points directly inwards to the lower part of the opening of the antrum into the attic, which opening is always above its level.

Operative Guide to the Descending Part of the Facial Nerve.

When removing the posterior meatal wall down to the level of the floor of the meatus the facial nerve is in some danger; to obviate it Hugh Jones, of Liverpool, has given us a most useful guide.

If an imaginary line be drawn from the outermost part of the exposed external semicircular canal to the highest point of the floor of the meatus it will always have the nerve internal to it, and therefore the bone outside it can safely be removed.

The descending part of the nerve does not always run straight down or with an inclination outwards, for in one specimen it curves inwards after leaving the external semicircular canal with a final outward bend before emerging at the stylomastoid foramen. (Fig. 8.)

Some Curiosities.

(1) A small exostosis on the inner aspect of the body of the incus.

(2) A gap, apparently for a vessel, on the outer surface of the mastoid process leading to the cells.

(3) A fissure runs through to the outer and upper corner of the bone marking off the outer antral wall. The cause of the condition is doubtful: a healed fracture (?).

(4) Ossification of the stylohyoid ligament.

(5) Among the series of fractures is a bone with what looks like another oval window below the normal one. Instead of the lower edge of the oval window being bounded below by the promontory, its place is taken by a thin horizontal bar of bone below which is an almost

identically shaped gap. The promontory and round window are set farther forwards, so that some part of the membranous labyrinth must have been in contact with the lining membrane of the middle ear. There is no doubt that the fracture had nothing to do with the condition.

(6) Marked "lipping" of the edges and suture and irregularities on the outer surface of the mastoid process are well seen in at least five bones, and in one the round window is partially obliterated by a process of bone passing downwards from the promontory. The condition suggests a rheumatoid affection.

IMPROVEMENTS OF THE RESPIROMETER AND ITS DISINFECTION.

BY CHARLES AUBREY BUCKLIN, A.M., M.D.,
NEW YORK.

THE uses of the respirometer for deciding when an operation is necessary, the amount of effect required, and the elevation of the atmospheric relations attained as the result of operations for diseases of the respiratory tract, have been published.¹

The latest respirometer represents a large amount of experimental research. It consists of a glass tube 40½" in length, ¾" in diameter, with a bore ⅛". To each end of this tube is fitted a stiff piece of rubber tubing 3" in length, which extends ¼" beyond the ends of the glass tube. A notch ⅛" in diameter and ⅛" in depth disposed at right angles to the bore is burned into the end of each piece of rubber tubing with the aid of a hot wire nail. At thirty inches above each notch is placed the lower margin of a ring of rubber tubing ⅛" in breadth. In the middle of the glass tube is placed a ring of rubber tubing ½" in breadth. The projecting pieces of rubber tubing give perfect protection against breakage at the ends. They also protect the patient's mouth from injury by contact with the bare ends of the glass tube. An end piece of this rubber tubing is always introduced into the patient's mouth, depressing the tongue. The lips should grasp the lower end of the upper piece of rubber tubing.

¹ ARCH. OF OTOTOLOGY, vol. xxxvi., No. 4, 1907, p. 398.

The respirometer enters the mouth 3" every time it is used. This prevents the soft palate and the tongue from closing the instrument from the suction occasioned by a nasal inspiration.

The $\frac{1}{2}$ " central rubber ring protects the glass tube from breaking while in the disinfecting case. With these five pieces of rubber tubing the respirometer is protected sufficiently to be carried by the surgeon without accident. It cannot be transported in a trunk. The $\frac{1}{8}$ " rings are used to indicate the distance to which water is raised above or below their lower margins. This distance is measured when the examination is made.

A clean glass tumbler in which is placed $\frac{1}{2}$ " of water is set on the floor and into this tumbler one end of the respirometer is immersed. The patient is requested to expire thoroughly through his mouth; he is then asked to take the lower end of the upper rubber tube air-tightly between his lips and to make the strongest, quickest nasal inspiration possible. The water is raised to about 37" in the average case of hypertrophic nasal catarrh which represents a vacuum upon the respiratory tract of one and thirty-six hundredths pounds to the square inch. The height to which water is raised in the glass tube during this forced nasal inspiration provides for the estimation of the vacuum formed in the respiratory tract. No attempt should be made to use glass tubing with less than $\frac{1}{8}$ " bore. Where it is too minute a column of water will be raised which is too small to be distinctly seen, and the time required for it to rise to the height corresponding to the vacuum formed will be sufficient to defeat the object for which the respirometer was constructed.

Disinfection of the Respirometer.—This is the subject upon which most of the experiments have been made. Experiments have shown that steam cannot be used to disinfect the tube as the effect of the steam on the rubber is to produce an opaque deposit on the glass and the heat is likely to crack it.

Every possible metal has been tried for the purpose of making a disinfecting case which will hold a solution of bichloride of mercury without decomposing this chemical, but they all cause it to be destroyed by precipitating the mercury and the acid attacks the metal.

A disinfecting case made of vulcanized rubber $\frac{5}{8}$ " in diameter, with a bore of $\frac{5}{8}$ " and a length of 42", was finally found to be satisfactory in every respect. The bottom cap closing this piece of hard rubber tubing was screwed on and cemented while the top cap was so adjusted that it could be manipulated with the fingers.

An aqueous solution of bichloride of mercury is made containing two commercial tablets to each fluid ounce of water used. These tablets are of the strength of 1 to 1000 when one is dissolved in a pint of water. This makes the solution used of a strength 1 to 31.25. This solution is placed in the disinfecting case to a height sufficient to cover the glass tube. In two minutes the infectious properties of all germs that can become lodged on the respirometer are destroyed.

A water bottle or pitcher is filled with fresh water into which is immersed for one minute the end of the respirometer which is to be placed in the patient's mouth. This will remove the chemical sufficiently to prevent any injury to the patient. This chemical can be tasted quite as distinctly when diluted with water in the proportions of 1 to 100,000 as it can after this immersion.

The disinfecting solution should be securely confined in the disinfecting case by screwing the cover tightly down. In this event the glass tube is less likely to be broken. A pipe wrench 6" in length should be kept for unscrewing this smooth rubber cover which is usually screwed tightly down.

With the respirometer, one can measure the effect produced by any operation for nasal obstructions and the surgeon is placed in immediate possession of the

facts upon which to base his praise or criticism of the operations performed.

The author has determined by experiment that to treat hypertrophic nasal catarrh and most of its complications, it is necessary to reduce the patient's ability to raise water in the respirometer to about one half the distance that it was raised before treatment commenced. This is usually accomplished by a complete removal of all deformities of the septum and a partial turbinectomy of the most prominent lower turbinated, or both lower turbinated bones may require partial removal to meet the necessary requirements. The coverings of these bones are always affected with hypertrophic nasal catarrh.

In complications where neurotic peculiarities are features of the diseases, as hay fever and asthma, it has been found necessary to perform a double partial turbinectomy upon the lower turbinated bones for the purpose of reducing the ability to raise water in the respirometer to one-fourth what it was before treatment commenced.

The double operation is necessary for successful treatment of the diseases hay fever and asthma. They are usually benefited in about three months after the proper operations have been performed. The elevation of the atmospheric relation is computed according to the following facts. When at the sea-level the atmospheric pressure is fifteen pounds, physics states that at three miles' elevation the pressure is seven and one-half pounds.

Were experiments with the respirometer to be made with the pressure reduced to seven and one-half pounds, the water could be raised to only one-half the height it was raised with double this pressure. Three miles reduced to feet are equal to 15,840. You consequently divide this number of feet by half the number of inches that the patient is able to raise water in the respirometer at the commencement of treatment and the quotient

represents the number of feet in elevation which corresponds to each inch the patient's ability to raise water in the respirometer has been reduced as the result of the nasal operations.

The respirometer is commended for the purpose of settling disputes among the profession as to whether an operation is necessary and when a satisfactory or an imperfect operation has been performed for nasal obstructions.

Should a patient be able to raise water to 36" and operations reduced this ability to 18," he has had his atmospheric relations elevated three miles; should it have been reduced to 9" they would have been elevated to four and one-half miles.

The author has demonstrated, by clinical experience, that equalizing the differences between external and internal pressures during inspirations has the same beneficial effect upon the health of the patient, no matter in which manner they are equalized. When produced through an elevation of the altitude, the patient must change his residence to a place where it may be inconvenient for him to live; when equalized by properly enlarging the nasal passages, the patient may select his residence wherever he finds it convenient to live.

The average man will not find business opportunities as numerous or advantageous at an elevation of five thousand feet, as they can be found in the remainder of the world.

THE INCREASE OF THE SPECIFIC GRAVITY OF
PUS IN OTITIS MEDIA SUPPURATIVA ACUTA
AS AN INDICATION FOR OPENING THE
MASTOID PROCESS, AND THE ERRORS CON-
NECTED WITH HAMMERSCHLAG'S METHOD.

BY P. TETENS HALD, M.D., COPENHAGEN.

Translated by Dr. GERHARD H. COCKS, New York, from *Zeitschr.
f. Ohrenheilk.*, Vol. LIII., p. 281.

KNOWING how difficult it is to decide when to open the mastoid process in the course of an acute middle-ear suppuration, af Forselles has attempted to find a new and exact diagnostic aid. He believes the estimation of the specific gravity of the pus furnishes this indication.

We do not refer to the cases with abscess or fistula behind the auricle, sagging of the posterior superior canal wall, intracranial complications, or facial paralysis, where we naturally operate without delay. Nor do we wait long when we find protracted pain in or behind the ear, even though drainage through the perforation in the drum is free.

What is the proper course to pursue in those cases where the mastoid process appears absolutely sound, and nothing abnormal can be elicited by palpation or percussion, where the above mentioned series of symptoms is completely lacking, and the patient sleeps and eats as usual, in fact, appears to be perfectly well, apart from the suppuration and hardness of hearing? Here

it is often difficult to make up our mind to operate, and yet the operation, when finally performed, demonstrates extensive destruction of the mastoid process, with perhaps exposure of the sinus or dura. In such cases we are guided by two symptoms. One is that the suppuration continues to be profuse notwithstanding the fact that a moderately long interval (three or four weeks) has elapsed since the beginning of the disease. The other is that the purulent secretion assumes a more cream-like consistency, because it contains a relatively greater quantity of pus cells. Although these two symptoms indicate in all probability a condition of the mastoid which is unlikely to heal without operative interference, still we are often uncertain, and postpone operation. Yet it is surely better to operate once too often than to delay once too long. We shall therefore welcome any new symptom which will help us decide these doubtful cases. Such a sign, as I have said before, af Forselles believes he has discovered in the estimation of the specific gravity of the pus found in the external auditory canal.

In a treatise published in 1905, he gives the results of his investigations in the following words: "For the reasons given above I have come to the conclusion that if, in the course of an acute middle-ear suppuration the specific gravity of the pus goes above 1.045 the occurrence of an empyema of the mastoid process may be suspected, and if it reaches 1.046-1.047 or higher, I hold the diagnosis certain."

To judge by these precise instructions, we would suppose that af Forselles had succeeded in finding an unusually valuable objective symptom. The value of his work decreases, however, when we come to study his technique. Af Forselles has made use of Hammerschlag's method for the estimation of specific gravity of blood and serum. I shall cite verbatim the description of this method as described by af Forselles.

"The other method is the indirect method of *Hammer-schlag*. It is carried out as follows: a mixture is used composed of two fluids, for example, chloroform and benzol or benzin, the one of which is heavier, and the other lighter than the exudate to be examined. If now a drop of the exudate is placed in the mixture, and chloroform or benzin added, as is needed, the drop of pus is held in suspension at a certain level, provided the mixture has the same specific gravity as the exudate. The specific gravities of the mixture and of the exudate are now determined areometrically."

"The method is very convenient, and gives fairly accurate results. Moreover it does not require a laboratory or costly instruments, and may be carried out in a few moments. I shall now describe this method as I have practised it."

"In estimating the specific gravity of the ear-secretion, we need a bottle (fitted with a dropper) for chloroform, and another bottle for benzin. We must also have a cylindrical glass about 10cm high and 1½cm in diameter, an areometer, and a flask for mixing chloroform and benzin. I use a mixture of seven parts benzin and five parts chloroform. The specific gravity of the mixture is about 1.020. The secretion in the canal is sucked into a capillary tube. The cylindrical glass is filled two-thirds full with the mixture. A drop of pus is blown from the capillary tube into the mixture. The glass is stoppered with the finger and rotated once. If the drop of exudate sinks to the bottom, chloroform is added drop by drop; if it floats, benzin is added. In most cases we may add the chloroform quite rapidly at first. It sinks to the bottom and mixes with the fluid until the drop of exudate shows a tendency to move. We must then add the chloroform more carefully, until the exudate is held in suspension. If the exudate floats on the surface, it is necessary to add a few drops of benzin, and after each addition to close the cylinder with the finger and revolve

it once, since the benzin will otherwise remain at the surface. If now the drop of exudate stays at a certain level in the mixture, the areometer is quickly placed in the fluid and the specific gravity read. I do not first remove the drop of pus, for this consumes time. However, we should see that the pus does not adhere to the areometer. The mixture is then filtered, and preserved for future use in the flask containing the chloroform-benzin."

Since af Forselles has not given any other directions, either in the above description, or in his book, I am forced to conclude that he is not acquainted with the important faults in his technique. Accurate results can only be obtained by familiarity with those errors. I shall now give the faults connected with Hammerschlag's method and speak of their importance; I shall further show how they may be eliminated in the easiest way. Finally, I shall mention, in brief, my views upon the probability of being able to recognize, by means of such an examination, the indications for opening the mastoid process.

I.—ERROR CAUSED BY THE DIFFERENCE BETWEEN THE
SURFACE TENSIONS OF WATER AND BENZOL-
CHLOROFORM.

If an areometer floats in a fluid, *e. g.*, water, the surface tension of the fluid exercises a downward tug on the spindle, so that the instrument sinks until it has displaced not only its own volume of water, but also sufficient water to equalize the force exerted by the surface tension. As the surface tension of the B.C. mixture = about one-third that of water, the areometer reads too high.

This error is constant for the same areometer, but inconstant for instruments of different sizes, as shown in the following table by A. G. Levy.

Number of areometer.....	1	2	3	4
Weight in grams.....	15.3	11.4	3.8	2.9
Diameter of spindle in <i>mm</i>	3.95	4.37	3.55	3.13
Error.....	0.003	0.005	0.012	0.013

The smallest of these instruments (No. 4) reads 0.013 too high in benzol-chloroform; *i.e.*, it indicates a specific gravity of 1.043 instead of 1.030. It is probable that af Forselles used an instrument corresponding to No. 3 or No. 4 in this table, consequently his error amounts to about 10 divisions.

II.—ERROR CAUSED BY THE ESTIMATION BEING MADE IN DIFFERENT TEMPERATURES.

This error, though slight, is too high to disregard, as Hammerschlag advises. As is well known, most bodies expand in an increasing temperature, different bodies quite differently for the same temperature. When the pus in the benzol-chloroform expands, its specific gravity naturally diminishes. The amount of this change in density depends upon the size of the coefficient of expansion of the pus, which I have estimated at 0.00018. I would therefore suggest that for every 5° which the observation temperature differs from that of the temperature at which the estimation is usually made (15°), the reading of the areometer be raised or lowered by 0.001 as called for.

III.—ERROR CAUSED BY A PORTION OF THE BENZOL-CHLOROFORM PENETRATING THE DROP OF PUS.

The specific gravity of the pus diminishes considerably if the drop remains longer than a minute in the benzol-chloroform. This is caused by the benzol penetrating the droplet. Hence I agree with Zuntz that the determination should be performed in the shortest possible time.

The first error, caused by the difference between the surface tension of water and that of benzol-chloroform, may be estimated by the following formula, suggested by Fock.

$$\frac{2 \pi r a}{V}$$

Here $2 r$ = the diameter of the spindle measured in centimetres, a the amount of surface tension in grams, and V the volume in *cc* of that portion of the areometer which sinks into the fluid. V may represent with sufficient exactness the weight of the areometer in grams. Since a for water = 0.0077, and for benzol-chloroform = 0.0028, according to the reading of my urometer for r and V , the surface tension of water will lower the reading of my instrument eight divisions, while the benzol-chloroform mixture only lowers it three. Consequently it is necessary to subtract 0.005 from the result obtained.

Af Forselles has used a benzin-chloroform mixture in his experiments. Experience has shown me that this acts exactly the same as benzol-chloroform. I have preferred to use benzol instead of benzin, as the former has been employed by almost all investigators, and is a body of known physical and chemical properties.

Af Forselles gives the indication for operative interference as follows: "If in the course of an acute suppurative middle-ear inflammation the specific gravity of the pus mounts above a certain level, which is higher than normal, it denotes the presence of an empyema of the mastoid process, and is therefore an indication for operation." (By empyema of the mastoid af Forselles means pus under pressure.) He believes that this increase in the specific gravity is due to the formation of granulation tissue in the mastoid cells, especially when drainage through the tympanum is not good.

There are several factors to be considered which throw discredit on this theory.

In the first place it is highly improbable that diseased

tissue in the mastoid cells invariably produces a secretion whose composition (with respect to the relative number of pus cells) is so constant that the specific gravity always remained above a certain level.

In the second place we cannot be certain that the pus found in the external auditory canal originated in the mastoid cells and not in the tympanic cavity.

Thirdly, the pus, while lying in the canal, may be altered by evaporation, by absorption of its fluid elements in the dressings, and by the addition of macerated epithelium from the canal wall.

Résumé.

1. The statistics of af Forselles for the specific gravity of pus in the course of acute suppurative otitis media are incorrect and too high.
2. If the specific gravity determinations are made by Hammerschlag's method, certain rules, above described, should be followed.
3. It is extremely doubtful if we can correctly diagnose empyema of the mastoid process by the estimation of the specific gravity of pus taken from the auditory canal.

REPORT OF THE SEVENTEENTH MEETING OF
THE GERMAN OTOLOGICAL SOCIETY AT
HEIDELBERG, JUNE 6 AND 7, 1908.

BY DR. J. HEGENER, HEIDELBERG.

Translated by Dr. PERCY FRIDENBERG, New York.

I. O. KOERNER (Rostock): **Conservative treatment of chronic middle-ear suppuration.** The term conservative applies to all procedures which can be used through natural channels (meatus, Eustachian tube) whether surgical, *e. g.*, ossiculectomy, or otherwise. Not every case of chronic purulent otitis is dangerous. Suppuration may be limited to the epitympanum, and the curative value of osteosclerotic processes has been shown by the findings at numerous radical operations. For this reason the prophylactic indication of the radical operation has been given up, and the latter must be justified by the presence of certain definite symptoms of actual danger. The most important and valuable of conservative measures is the regularly repeated and thorough cleansing of the tympanic cavity by syringing, if necessary, through a middle-ear canula. Of antiseptics hydrogen peroxide in solution may be of some value on account of its energetic mechanically cleansing effect. Boric acid powder is to be used with caution, and by the surgeon only, in case of a small perforation. Solutions of silver nitrate and alcohol are very serviceable in case there is much swelling of the mucous membrane. Rough spots on the promontory which delay healing are to be smoothed off with the burr. The removal of necrotic or partially detached ossicles facilitates treatment by making the depths of the tympanum more accessible and drainage more easy. The removal of nasal

or pharyngeal foci of suppuration is of great importance in preventing reinfection of the middle ear. Even chronic suppuration in the mastoid antrum may be completely cured by persisting in this syringing method as long as the disease process has remained limited to the mucous membrane and has not involved the bony walls of this cavity or of the neighboring mastoid cells.

The form associated with immigration of epidermis, otitis media desquamativa, requires thorough removal of the suppuration for a cure, and this can be effected by conservative measures only if the purulent process is limited to the epitympanum. If there is not evident and rapid progress and it appears that the masses come from the antrum, the latter cavity should be freely opened. Besides the local treatment, the constitution of the patient must be considered.

2. SCHEIBE (Munich): **What can we expect from conservative treatment of chronic middle-ear suppuration?** After defining chronic suppuration, Scheibe quotes statistics, which he considers very valuable (as opposed to Koerner^r) to prove that in the course of a chronic middle-ear suppuration Bezold's boric-acid-powder treatment and the methodical use of the antrum canula may be relied upon implicitly to prevent any mastoid involvement or intracranial complication. These unusually favorable results are confirmed by the experience of Bezold and Siebenmann. Wilde's law can no longer be upheld. Koerner, too, has opposed its validity in regard to central, in contradistinction to marginal, perforations. Of 50 cases of chronic middle-ear suppuration, only 1.5% failed to respond promptly to expert treatment by repeated and methodical direct injections and insufflations. In such an event, as shown by the persistence of fœtor of the secretion, radical operation without removal of the ossicles is indicated. The latter procedure should never be attempted *via* the external auditory meatus, as it is dangerous and generally unnecessary.

Discussion of papers 1 and 2: THIES (Leipsic) advises the removal of the lateral wall of the attic with or without preservation of the ossicles and of the drum, depending on the extent and location of the purulent focus in cases of chronic suppuration of the middle ear involving the epitym-

panum and antrum which have not been cured by consistent and prolonged conservative treatment. Cases with external evidence of mastoid disease are excluded. The removal of the outer attic wall is performed according to Neumann (Vienna) under local anæsthesia *via* the external auditory canal. Diseased portions of the posterior canal wall may, of course, be removed if necessary, in case there is evidence of involvement of the antrum.

DENKER (Erlangen): Koerner's silence in regard to the dry treatment of chronic suppuration is tantamount to disapproval which indeed is deserved if one considers the unfavorable results. After syringing, the middle ear can best be cleansed by the air douche (Politzerization) drying with cotton on applicators to be introduced into the tympanic cavity and antrum and, finally, boric acid powder. Long years of experience have demonstrated that there is no danger of retention of secretion due to the boric acid powder caking into a large mass. Denker then opposes the thesis of the reviewer (Koerner) that involvement of the antrum may be excluded where we have destruction of Shrapnell's membrane only, with intact pars tensa.

POLITZER (Vienna): The limits of conservative treatment cannot be drawn in a hard and fast line, as external conditions and considerations play an important part. If the medication is to have any effect at all, the air douche (Politzer bag) must be used. Then it is necessary to apply suction *via* the external meatus. Peroxide has little effect in curing suppuration. The addition of alcohol is of benefit. Nitrate of silver forms large coagula and is not to be advised in case of small perforations. In any case it is better washed out with plain water than with salt solution. Rough spots are not to be smoothed with the burr. This instrument is dangerous as it slips easily and may cause damage to neighboring structures. Hartmann's canula is a valuable instrument but is not always sufficient. It is materially aided by the sharp spoon in case of immigration of epidermis.

HARTMANN (Berlin) considers the use of his middle-ear canula with a rubber bulb as not sufficient. A good hard rubber syringe is necessary. Perforation of the pars flaccida of the drum is particularly ominous, as indicated by Denker.

PASSOW (Berlin): Bier's congestive hyperæmia is of no value in chronic suppuration, but suction treatment is often followed by good results. The addition of formalin three or four drops to the half pint is warmly recommended.

KUEMMEL (Heidelberg) calls attention to the value of instrumental dilatation of the Eustachian tubes with bougies in many cases of meso-tympanal suppuration.

SIEBENMANN (Basel) discusses the use of boric acid which he thinks has been rather unfairly treated in the reports of Koerner and of Scheibe. In irrigation treatment it is certainly to be preferred to toxic antiseptics, and it is of value in preventing decomposition in the middle-ear cavity, which, as we know, can never be kept quite dry.

FREY (Vienna): Alcohol treatment, as recommended by Politzer, contracts the blood-vessels. Adrenalin does the same thing, and the subsequent hyperæmia may have the same effect as Bier's treatment.

RUTTIN (Vienna): Extraction of the incus and malleus is free from danger if it is preceded by a careful test of labyrinthine function. The pathologic anatomical findings show that not even all chronic suppurations of the mucous membrane can be cured by conservative treatment, to say nothing of the cases with bone involvement. Much may be accomplished by energetic application of caustics such as lysol, trichloroacetic acid, and so on, after preliminary local anæsthesia, in suitable cases. There is always a possibility of pus foci escaping us if they are situated very deep or in some inaccessible corner. Such foci may be a source of imminent danger if they are situated near the sinus.

BLOCH (Freiburg) strongly urges blowing out the middle-ear after syringing with the tympanic canula. He presents a modification of this instrument for the purpose indicated. He believes that it is impossible to carry a cotton applicator into the antrum, as claimed by Denker. If there is very little secretion in the antrum, treatment by the dry method is to be preferred.

KRETSCHMANN (Magdeburg): Some suppurations run a protracted chronic course from the very beginning and arouse the suspicion of tuberculosis. They require constitutional treatment and a return to tuberculin therapy.

WANNER (Munich) advises elastic catheters for syringing, and insists on a sufficiently powerful stream of fluid. The conditions of distribution of fluid in the middle-ear during syringing can be demonstrated by a gross specimen with fenestræ. Subsequent careful drying with a soft probe is of importance.

HERZOG (Munich): Scheibe's indication for operation, depending on the cure or persistence of fœtor after continued treatment, is not the only one. As Politzer has pointed out there is a relative indication, based upon the social conditions of the patient. It should not be forgotten that boric acid treatment led Bezold to a discovery of the importance and significance of perforations in Shrapnell's membrane.

VOHSEN (Frankfurt): The addition of antiseptics and other chemicals to the irrigation fluid is of much less importance than the thorough and energetic mechanical cleansing. The trephine is to be avoided as dangerous, and weak perhydrol applied on cotton swab. Blowing out the ear may cause unpleasant symptoms, such as unconsciousness and is to be used only with great caution.

WOLF (Frankfurt) is in favor of treatment with alcohol, to which he sometimes adds resorcin or bichloride, and finds that it is of value even in acute cases.

Closing of *discussion*. SCHEIBE (Munich) would consider as a cure a cessation of suppuration for over a year. Later, relapses occur frequently, and in cholesteatoma they are invariable.

KOERNER (Rostock): There seems to be a general agreement on the main points of treatment. Thorough mechanical cleansing is the all-important point, and the middle-ear canula is a valuable aid. He has finally abandoned the burr, although it is by no means dangerous if used with caution and with foot power instead of being run by an electric motor. Boric acid in the hands of the surgeon is never dangerous if used appropriately, and general constitutional treatment must always be considered.

3. HEGENER (Heidelberg): **Measurement of high-pitched weak tones.** The method is intended to give a more delicate measure of rapid vibrations than is possible with Kundt's tubes and other appliances now in use. For this purpose it

is necessary to avoid the waste of power inherent in the use of a solid body as an indicator. Hegener uses a gas flame for this purpose. The apparatus consists of a Seebeck tube; the ear being replaced by a very sensitive gas flame under high pressure. By means of the resonance which results, the delicacy of this method surpasses even that of Lord Rayleigh, as the defects of the latter depending on the size of the flame and the heating of the air, are avoided. The accuracy is remarkable, and the method is an objective one in Melde's sense.

4. HEGENER (Heidelberg): **Suggestions for the determination of the upper tone limit.** The assumption of a physiological upper tone limit with 50,000 double vibrations, (Schwendt, Edelmann) is incorrect as Myers, Schulze, and the reader have shown the limit to be 20,000 d. v. The error is due to the fact that in blowing the Galton whistle by compressing a rubber bulb a series of tones is produced, the lowest of which lie several octaves below the ground tone of the whistle as determined with Kundt's tubes. These "edge tones" are responsible for the errors in determination of the upper tone limit. Blowing the whistle with constant pressure is open to the objections of marked practical difficulty, the disturbing feature of a blowing noise, and the possible deception by friction tones. Galton's whistle had better be given up. A better instrument seems to be offered in the monochord recently perfected by Schulze, in which the tone source is a single stretched string giving longitudinal vibrations. Tuning forks, or Melde's tuning plates may, if necessary, be used in addition.

Discussion of papers 3 and 4: SCHAEFER (Berlin): The intensity of tone of the monochord is not so much lower than that of other instruments, as to give a lower upper tone limit than is usually found, say, by means of the Galton whistle. Schulze has demonstrated this fact beyond a doubt.

BOENNINGHAUS (Breslau): Considering the limited number of fibres in Corti's organ, an upper tone limit of 20,000 d. v. is in better accord with the theory of Helmholtz than one of 50,000 d. v.

DENKER (Erlangen) calls attention to the comparatively small number of fibres in the organ of Corti of parrots, and

notes that the experiments would not prove the theory of Helmholtz.

SIEBENMANN (Basel) notes the correspondence of these results with those obtained by earlier investigators who experimented with vibrating rods.

In closing the discussion, HEGENER (Heidelberg) notes that there is an area near the upper tone limit in which there is no accurate sense of difference of pitch so that it is quite possible that the highest perceivable tones correspond to an area of fibres which is set in action by any one of them.

5. BÁRÁNY (Vienna): **Deafening alarm for the detection of unilateral deafness.** The sound ear is deafened by the noise caused by the apparatus in the external auditory canal, which consists of a membrane to be struck by a hammer run by clock work. The noise is conducted to the ear directly through a funnel. The hearing of the ear to be examined is not perceptibly affected. The apparatus is handy and portable. The noise is of even intensity. In cases of paracousis Willisii, application of the apparatus was followed by improvement of hearing lasting several days. Diagnosis and treatment of this affection may be facilitated by Bárány's instrument.

Discussion: Voss (Frankfurt) was able to produce a similar result and exclude one ear by compressing the air in the external auditory canal.

SCHEIBE (Munich) thinks the method a valuable one and that it promises good results in the examination of deaf mutes.

BÁRÁNY (Vienna) in closing the discussion answers a question of Boenninghaus, to the effect that hearing is somewhat affected on the side to be tested.

6. KARL L. SCHAEFER and H. SESSOUS (Berlin): **Significance of the middle-ear apparatus for audition, particularly of low-pitched tones.** The lower tone limit was determined by means of Edelman's forks in thirty-four ears which had been subjected to the radical mastoid operation. With few exceptions it was found in the main octave or the octave below the staff. As it has previously been shown that after radical operation there is preservation of perception of medium, high, and highest tones, these investigations show on the whole that qualitative tone-perception is not affected

markedly by loss of the middle-ear apparatus. Quantitatively the disturbance is much more marked. This is a matter of common experience and is borne out by the careful investigations of F. Wagner. In the absence of the membrana tympani and the ossicular chain duration of tone perception is shortened in proportion to the lowness of the tone. The lower the tone, the shorter the duration of perception.

Discussion of 6: O. WOLF (Frankfurt) calls attention to the fact that as far back as 1870 he himself had tested the hearing for speech after removal of the ossicular chain, and had demonstrated the raising of the lower tone limit.

BOENNINGHAUS (Breslau) notes that the amount of contractions of the lower tone limit depends on the degree of cicatricial stapes fixation or bony ankylosis, and vigorously opposes Bezold's assumption that the drum serves only to transmit low pitched tones.

SIEBENMANN (Basel) objects that Bezold's material was quite different from that studied by the writers of the paper (Schaefer and Sessous).

HERZOG (Munich) points out that even Bezold, later on, as the tuning forks were improved more and more, found that the lower tone limit was lower than he had originally supposed.

BLOCH (Freiburg) inquires whether over-tones of low pitched forks can be quenched by stroking, and whether the mobility of the stapes had been tested in the series of cases reported by Schaefer and Sessous.

VOHSEN (Frankfurt) calls attention to an apparatus, which, it is claimed, allows the intensity of tones transmitted to the ear to be gradually and measurably diminished.

SCHEIBE (Munich) expresses his disapproval of this apparatus.

WOLF (Frankfurt) asks the general opinion as to the value of microphones as aids to hearing. Personally, he has found them useless.

In closing the discussion, Schaefer (Berlin) stated that over tones of tuning forks cannot be eliminated, while those due to jingling in consequence of irregular or violent striking can be done away with easily. The fundamental tones can be

intensified by resonators. Ankylosis of the stapes was not proven. The sound-conducting apparatus has its main function in the field of the lowest tones.

7. WANNER (Munich): **Functional tests in congenital syphilis.** Bezold was able to demonstrate congenital syphilis as a cause of acquired deaf-mutism in 5.6% of his cases; the impairment of hearing becoming manifest between the seventh and eighth or the eleventh and twelfth years. Wanner has followed 15 more cases carefully. In 5, mixed antisymphilitic treatment was used, with good results in 3. The fields of audition, presented by the reader, showed a picture of a sharply limited involvement of the inner ear. The female sex is predisposed in the proportion of 5:2. Diminution of hearing comes on rather suddenly. There is generally a history of previous keratitis, 2-4 years before and traces of corneal infiltration of a specific character can usually be seen. The keratitis may become active with the appearance of the ear disease. Hutchinson's teeth were present in half the cases. Tinnitus and vertigo were comparatively rare. The personal and family history is of the greatest importance in establishing the diagnosis and etiology.

The otoscopic picture is that of occlusion of the Eustachian tube, so that errors in diagnosis are easily made, especially if we fail to test carefully with the whispered voice. The words "four," "six," and "seven," are heard particularly badly. The lower tone limit is frequently raised; osseous conduction markedly shortened or abolished, with large defects at the upper tone limit, and positive Rinne. Qualitative defects, too, are not at all infrequent. The prognosis is doubtful, and therapeutic measures consist mainly in vigorous mixed treatment (inunctions and iodides). Unless some steps are taken to preserve it, speech is rapidly lost, even at the age of fifteen to eighteen. As long as a vocabulary is retained the children should be entered in the hearing classes of deaf-mute institutions as soon as possible.

Discussion of 7: BÁRÁNY (Vienna) has noted loss of response to stimuli in the vestibular apparatus in hereditary lues.

NADOLCZNY (Munich) has found almost exactly the same aural conditions as those reported by Wanner in the

children of a single family, where hereditary lues could not be made out beyond a doubt, and asks whether the vestibular apparatus responds to stimulation in cases where audition is still partially preserved.

HARTMANN (Berlin) notes that large doses of the iodides are well borne by children and are frequently very efficacious.

MUELLER (Heilbronn) reports one case in which local and general antiluetic treatment was used without effect.

MANN (Dresden) finds that the keratitis responds more promptly and satisfactorily to the antiluetic treatment than does the affection of the auditory nerve. In the latter, the positive results are very meagre.

EHRENFRIED (Kattowitz) claims that in these cases the iodides are more efficacious than inunctions.

WAGENHAEUSER (Tuebingen) has seen a large number of cases and finds the age limit very interesting. Two cases had passed the twentieth year. Keratitis had invariably preceded the aural affection. In but a single case was this relation reversed.

In closing the discussion, WANNER (Munich) corroborated the statement of Mueller and of Mann that the keratitis responds promptly to treatment while the acousticus affection is but slightly influenced.

8. DENKER (Erlangen): **Demonstration of three new ear-models.** These models were made at the request of the Bavarian Government by Bezold with the assistance of the sculptor, Hammer, of Munich, and have been placed in the new German Museum. In the first model, representing the entire organ of hearing, a vertical section from without inward shows the complicated form of the external auditory canal, and then turns and runs forwards and inwards along the axis of the Eustachian tube, leaving the drum intact. The entire middle-ear tract with the ossicles is clearly seen. The inner ear shows the cochlea laid open, in relation to the medial wall of the tympanic cavity, the vestibule, semicircular canals, and the internal auditory meatus with the acoustico-facial nerve. The second model is a corrosion specimen, magnified seven times, and giving an excellent

idea of the form and arrangement of all the pneumatic spaces of the organ of hearing.

The third model represents the tympanic cavity, highly magnified (20 times). It can be taken apart to show the relations of the various structures to the outer and inner wall of the middle-ear. Denker considers these models as valuable additions to the material for demonstration, especially for instruction in Universities.

9. SCHOENEMANN (Bern): **Demonstration of five built-up models of the human ear.** These models show an ear, magnified fifteen times, in flat sections which are assembled and can be taken apart to show the practically important structures in their natural relations.

10. POLITZER (Vienna): **The anatomical relations of the foot-plate stapes in otosclerosis.** Demonstration. (Microstereoscopic views.) P. demonstrates a number of histological specimens of cases of otosclerosis observed during life, in which the invasion of the stapes by the bone disease of the labyrinth capsule can be followed and studied in its successive stages. Many sections through the labyrinth capsule and stapes plate give the false impression that the otosclerotic process develops primarily in the latter. Serial sections of the same specimen, however, invariably prove a direct and immediate connection of the bone changes with those in the labyrinth capsule. It appears, further, that the otosclerotic process is not a mere metamorphosis of normal osseous tissue, but that we have to deal with a true neoplastic formation which displaces the normal bony tissue. This bony proliferation becomes particularly marked where it passes over to the foot plate, so that the latter is replaced by a bony structure often many times the original thickness, as shown clearly by the specimens. Other specimens show, as opposed to Habermann's view, that this is always due to a primary affection of the labyrinth capsule.

Discussion: BRUEHL (Berlin) demonstrates microscopic specimens in a case of chronic progressive hardness of hearing, that of a woman of sixty-three. The middle ear was normal except for fixation of the stapes by a focus of spongification in the wall of the promontory, with a second focus in the wall of the internal auditory canal.

11. YOSHII (Tokio) and SIEBENMANN (Basel): **Demonstration of experimental acoustic injuries of the ear.** (Microstereopticon.) The specimens were taken from guinea-pigs which had been subjected to various intense noises: 1. Whistles of various tone pitch. 2. Roll of a tin drum. 3. Explosions. The changes caused by the whistle were located in Corti's organ and the corresponding nerves and ganglion cells. The higher the note, the lower the situation of the lesion in the cochlea. A siren with a range of tone from f^3 - f^4 causes changes throughout the entire extent of the membranous labyrinth, after a short application. The most extensive destruction was caused by explosions. A single shot with a toy pistol and cap may shatter the entire organ of Corti, and cause multiple varicosities of the nerve with degeneration of the ganglion cells, and some lesions of the vestibular apparatus.

Discussion: MARX (Heidelberg) reports on experimental injuries by noises. He used the capped pipes of Edelmann's series of 11,000 and 19,000 d. v. under constant pressure, measuring the number of vibrations by means of Kundt's tubes. In mice no marked lesions were found. Guinea-pigs showed some changes due to high tones, situated somewhat lower basalwards than those recorded by Wittmaack. Experiments intended to cause degenerative lesions of the vestibular apparatus by adequate stimuli, mechanical tossing and rotation, had only negative results.

SCHEIBE (Munich) notes that these animal experiments do not correspond in their results with experiences in human beings, as regards the effect of explosions.

SIEBENMANN (Basel) thinks the experiments do not allow us to generalize or to draw any broad conclusions for practical otology.

HEGENER (Heidelberg) reports that in his own case, continued listening to high pitched whistle tones, 10,000 d. v. resulted in deafness for these tones, lasting thirty-six hours, and associated with high pitched tinnitus which, however, disappeared in time.

KOERNER (Rostock) asks whether there was any lesion of the nerve terminals of the semicircular canals in these

experiments, as a negative finding would be valuable evidence against the views of Hensen.

SIEBENMANN (Basel) reported that varicose dilatation of the nerves appeared only after explosions.

DENKER (Erlangen) claims that the observations in cases of deaf-mutism speak against Hensen's hypotheses.

KOERNER (Rostock) thinks, that in spite of apparently contradictory results so far, a continuation of these experiments offers promise of added knowledge as to the functions of the inner ear.

12. SIEBENMANN (Basel) and YOSHII (Tokio): **Specimens of circumscribed labyrinthitis.** Demonstration. Microstereoscopic views. The cochlea of a guinea-pig was found to have a purulent focus at the base, and one at the apex, due to extensive middle-ear suppuration. The two middle turns were not affected.

Discussion of 12: WITTMACK (Jena) called attention to the interesting phenomena presented by labyrinthine suppurations in animal experiment.

SIEBENMANN (Basel) calls attention to the possibility of artefacts in the microscopical specimens. If these are not hardened and fixed with extreme care and perfect technique severe lesions may be simulated.

13. ALT (Vienna): **Demonstration of microscopic specimens of labyrinthine suppuration and its sequelæ following epidemic cerebrospinal meningitis.** (Micro-stereopticon.) The first case was that of a boy of sixteen, who died only nine days after the first symptoms developed. The specimens show purulent interstitial neuritis of the cochlear, vestibular, and facial nerves, and fresh pus deposits in the cochlea, vestibule, semicircular canals, and inner wall of the tympanic cavity.

The second case was that of a young man of eighteen, who died on the sixty-seventh day of the disease, after having been under observation in the hospital for fifty-nine days. The specimens show the results of a turbulent labyrinthitis with almost complete destruction of the membranous structures and new-formation of vascular connective tissue with partial, and at some points complete, ossification of the cochlea, vestibule, and semicircular canals. The specimens in the third case, that of a laborer aged twenty-one years,

whose disease lasted sixty-one days, are characterized not so much by purulent infiltration, bony or connective-tissue proliferation in the labyrinth, as by complete destruction and fibrous degeneration of the nerve terminals of the entire labyrinth.

14. MARX (Heidelberg): **Lesions of the labyrinth due to radiant energy.** After a single exposure of the labyrinth of doves to radium, lasting one hour, labyrinthine symptoms came on after a period of latency of six months. Microscopic examination showed that they were due to degeneration of the sensory epithelium of the maculæ and cristæ acusticæ. No other lesions could be found. This observation may be of some therapeutic value in vestibular affections. In guinea-pigs, exposure of the cochlea to radium was followed by degeneration of Corti's organ. There was also an area of bony and connective-tissue degeneration and proliferation at the tip of the cochlea, but this was due to mechanical injury. Experiments with X-rays, which have not been concluded, have so far had no definite results.

15. RUTTIN (Vienna): **The question as to an ectasia of the cochlear duct.** Demonstrations of specimens, plates, and tables. We have to deal with a displacement of the membranous structures of the labyrinth which appears to be characteristic of an inflammation which slowly spreads through the labyrinth wall, "induced labyrinthitis." The ectasia affects the entire ductus cochlearis, although in the histological specimen it appears to be limited to the first half of the basal turn, as it is in this turn, alone, that Reissner's membrane is kept in its ectatic position by the exudate which settles along the inner side of the wall of the labyrinth and later becomes organized. In contrast to this "induced labyrinthitis," Ruttin found the membranous structures of the ductus cochlearis invariably destroyed in acute genuine labyrinthitis with an ascertainable port of entry of suppuration or evident perforation.

16. R. NAGER (Basel): **Demonstration of formation of labyrinthine sequestra in carcinoma of the middle ear.** (Stereopticon views of colored photographs, after Lumière.) In the case of a patient aged eighteen years, with a bad family history, an epithelioma developed on the site of an old middle-

ear suppuration with cholesteatoma which had been operated on in childhood. In spite of repeated attempts at extirpation, death took place in ten months. In the microscopic specimen a series of perforations was found in the vestibule, particularly at the orifices of the semicircular canals. There was an extensive fibrous and ossifying labyrinthitis, of a chronic type, in the cochlea. This is not characteristic of carcinoma, but must be considered as the residuum of an old labyrinthine inflammation which has run its course. Whether this took place in childhood or developed under the direct influence of the cancer, is an open question. The sequestrum was not completely necrotic, as shown by its vascularity and the fact that the cellular elements took the stains fairly well, but this observation shows that cancer, as well as tuberculosis or cholesteatoma may cause partial or total sequestration of the labyrinth. There is no similar case on record in literature.

17. FREY (Vienna): **Demonstration of microscopic specimens of developmental anomalies of the ear.** These specimens showed deformities in anencephalous monsters, and the question of their mode of origin was discussed.

18. DENKER (Erlangen): **Demonstration of a Bezold-Edelmann model of the tone-conducting mechanism of the ear.**

19. VOSS (Frankfurt): **Clinical report on non-suppurative labyrinthitis in acute and chronic otitis media.** After an historical review of the arrangement of the affections of the inner ear in suppurative and non-suppurative groups, the writer presents his own observations on serous labyrinthitis, and draws the following conclusions:

1. The labyrinthine inflammation, occurring in the course of a genuine, *i. e.*, not scarlatinal or tuberculous, otitis media is generally serous, not purulent.

2. It may be circumscribed, or diffuse.

3. A decision as to the localization and the area involved can be reached only after the most painstaking and thorough functional examination of the acoustic and static labyrinth.

4. The diagnostic differentiation of diffuse serous from diffuse purulent labyrinthitis in acute otitis media is facilitated by the almost simultaneous development of the former, with the causal suppuration in the middle ear, its rapid course, and favorable termination.

5. The circumscribed serous form differs from the purulent, also, in its early onset in otitis media, rapid course, and benign termination both in regard to disturbance of function and final cure. In circumscribed serous labyrinthitis the usual fistula symptom is absent.

6. As far as preservation or restitution of function is concerned the circumscribed form is the more benign of the two.

7. As to final recovery and cure, the two forms are on a par.

8. The healing of the inner ear affection generally keeps place with that of the otitis media.

9. Accordingly we must aim at a rapid cure of the middle-ear suppuration, if necessary by operative attack on a co-existing mastoiditis, to prevent lasting impairment of the delicate membranous and nervous structures of the inner ear.

10. The mastoid operation cannot be expected to correct functional disturbances due to diffuse serous labyrinthitis.

11. In connection with the radical mastoid operation, symptoms of labyrinthine irritation may develop which are not due to fistula or to operative traumatism (injury of the semicircular canals, dislocation of the stapes).

12. The cause of these irritative symptoms is probably to be found in operative manipulations of the labyrinth wall.

13. These symptoms are the expression of a serous infection of the labyrinth, probably by way of the membranes of the fenestræ.

14. The inflammatory processes in this case may be diffuse or circumscribed.

15. This point can be decided only by functional tests of the acoustic and static labyrinth.

16. These affections are distinguished from gross traumatic lesions of the labyrinth, in that they do not develop immediately after operation. Twelve to twenty-four hours usually elapse before they are noted. They do not reach a maximum until several days after operation, and generally subside more rapidly than the symptoms of labyrinthine injury.

17. They are differentiated from purulent infection by

the mode of onset just described, the absence of fistulous changes in the labyrinthine wall, the absence of fever, and the restoration of function on recovery.

18. The prognosis is favorable as to function and recovery.

19. Treatment is purely expectative.

Discussion of 19: SCHEIBE (Munich) thinks the term "labyrinthine irritation" or "paralabyrinthitis" should be applied to these cases. Those with limitation of hearing should be treated separately from the cases with deafness.

HERZOG (Munich): There is no histological proof of the lesions in Voss's cases. The results in tuberculosis are not analogous, as Hinsberg has shown. Blau's experiments with metallic plugging of the fenestræ may clear up the subject.

RUTTEN (Vienna) observed marked labyrinthitis which subsided later on, in cases of radical operation which were irrigated with 10% solutions of formalin.

In closing the discussion Voss (Frankfurt) considers the affection in these cases to have been true labyrinthitis, in all probability.

20. BLOCH (Freiburg): **Etiology of ankylosis of the stapes.** After a cursory review of the various theories as to the cause of hyperostosis of the labyrinth capsule, as this affection should really be designated, from a correct histological standpoint, Bloch reports a case which was clearly inherited. In a large family he was able to find 6 cases in two generations by means of careful functional tests. In one of these cases histological examination post-mortem verified the clinical diagnosis.

Discussion. SIEBENMANN (Basel): Heredity undoubtedly plays an important rôle, but the family history is often misleading or incomplete. Other evidence of degeneration may be found. The word sclerosis is much abused.

POLITZER (Vienna) thinks that the well-known and traditional word, otosclerosis should be retained, at least for typical forms.

21. MANASSE (Strassburg): **Exostoses of the porus acusticus internus.** Specimens in the case of a woman, aged eighty-three years. Two thick nodules were found at the upper margin of the left internal auditory meatus, and extending to the sinus. On the right side the nodule is more

prominent but does not extend so far laterally. The histological structure was that of an ivory exostosis with foci of spongy bone containing medullary spaces. Tympanum, meatus, and labyrinth were free.

22. E. RUTTIN (Vienna): **Surgery of the temporal bone.** Demonstration. In a case of subacute purulent otitis with labyrinthine fistula and deep extradural abscess, Ruttin was obliged to extirpate the entire petrous portion in order to insure removal of all diseased tissue. The danger of hemorrhage, cerebral traumatism, and meningitis, is not imminent, and should not deter us. Aural surgery must not halt at the carotid canal. Ruttin notes that BÀRÀNY has recommended a similar procedure for removal of tumors of the auditory nerve, and has practised it on the cadaver.

Discussion: BÀRÀNY (Vienna): This case shows that removal of the pyramid is feasible, and he has recommended it, in place of the usual procedure for the extirpation of acoustic tumors. Tests of the vestibular function are decisive in these cases.

KUEMMEL (Heidelberg) advises the publication of this method in the surgical journals.

23. ALT (Vienna): **Operative treatment of otogenous facial paralysis.** The paralyzed facial nerve is marked by its extraordinary powers of regeneration. We see paralyzes which have developed in the course of a chronic middle-ear suppuration, or after a radical mastoid operation, and which clear up after a year or even more. There is, however, a small number of cases which persist in spite of the most careful conservative treatment. To restore the function of the paralyzed nerve in these cases, anastomosis of the facial with the hypoglossus or accessorius is advised. Alt has had a successful case of this sort. The nerve grafting can be considered by otologists only in those cases in which a large labyrinthine sequestrum has been removed with the greater part of the Fallopian canal in the course of a radical mastoid operation. In other cases we have much simpler methods at our disposal, which can be applied without injuring any other cranial nerves. In patients with old otitis media and facial paralysis of long standing Alt performs the radical operation in the following manner:

Careful hemostasis is applied to give a clear field. After clearing out the antrum and tympanic cavity, adrenalin is used freely, the Fallopian canal exposed to discover any necrotic areas in the bony wall, and the facial canal opened, centrally and peripherally from the solid angle. The canal is cleaned and the nerve freed from granulations or cholesteatomatous masses, and laid back in its opened bed. He observes a similar procedure in cases of post-operative facial paralysis which have lasted more than six months and which show no return of function and of electrical reaction, in spite of the usual measures. Instance of a cure by this procedure in a case of four years' standing was reported. The facial was exposed in the horizontal and vertical portion of the Fallopian canal for quite a distance. There was no actual loss of continuity at any point, but in the horizontal portion the nerve was imbedded in dense connective tissue instead of lying free in the bony canal. Alt was loath to believe that the imbedding in scar tissue alone was a sufficient cause of the paralysis, but that this was actually the case was shown beyond a doubt by the subsequent course of the case which went on to rapid and complete recovery.

Discussion of 23: UFFENORDE (Goettingen): has described the technique of exposure of the facial nerve for the purpose of operative treatment of labyrinthine suppuration. He doubts the possibility of recovery in facial paralysis of five to six months' standing.

ALT (Vienna): Not all cases of facial paralysis are curable by this operation, but a certain number will undoubtedly recover which would otherwise be lost, as spontaneous cure is unusual.

PASSOW (Berlin) observed recovery from facial paralysis, after secondary operation. The original operation had been performed ten years previously.

24. LINDT (Bern): **Case of rare localization of tuberculosis in the nose.** Case of a young man who had had an initial syphilitic lesion four years previously, had been treated thoroughly, and pronounced cured. In the posterior third of the right lower meatus, on the wall of the antrum, and extending to the lower turbinate, a dense soft nodule developed in the mucous membrane, looking very much like

an ordinary granulation tumor. This spread, leading to a defect of the antrum wall, without sequestration, fœtor, or inflammation in the neighboring tissues. Iodides were not tolerated, and had no influence on the growth which was radically cured by excision. Microscopic examination showed granulation tissue with unmistakable evidence of tuberculosis; non-vascular round foci of epithelioid cells with typical giant cells, but no syphilitic vessel changes. The patient had slight dulness at the apex, and gave a positive reaction to the cutaneous tuberculin test. The infection was probably hematogenous or lymphogenous. The case is interesting on account of the unusual localization of the tubercular focus in the nasal mucosa, and the previous luetic infection of the patient.

25. MARX (Heidelberg): **Demonstration of osteomata of accessory sinuses.** 1. Sphenoidal sinus osteoma in a man of thirty-five years. Exophthalmos of four years' standing. Sudden development of orbital cellulitis and high fever. Operation, three days later. Removal of a tumor 7cm long which almost completely filled the orbit. The eye was preserved. Uneventful recovery. Temporal half of visual field contracted, probably by traction on the globe during operation. Vision somewhat better than before operation ($\frac{1}{4}$). Motility good. No spontaneous diplopia. Satisfactory cosmetic result.

2. Osteoma of the frontal sinus in a woman of twenty-eight. Protrusion of the eye gradually increasing, since ten years. Some days before operation marked emphysema of the conjunctiva developed after an attack of sneezing. A nodular tumor, 3.5cm large, was removed, which was attached to the floor of the frontal sinus. Subsequent course and cosmetic result good. No ocular traumatism. No diplopia.

3. Osteoma of the ethmoid sinus in a man of eighteen years. Typical case. Large dense sclerosed tumor, 3cm large, springing from the anterior ethmoidal cells. Operative removal. Uneventful recovery.

Discussion of 25: MOELLER (Hamburg): Report of a case of ethmoidal osteoma in a patient twenty-six years of age. Diagnosticated in 1899 by Thost (Hamburg). An attempt

at removal by the intranasal method failed. In 1903 an ivory exostosis the size of a walnut was removed at Kiel. In 1907, Kuemmel (Hamburg) operated again, removing a tumor larger than a walnut from the anterior ethmoidal cells, after making an osteoplastic flap and turning down the hard palate. Three months later, a second growth was removed by Thost (Hamburg) by the intranasal route. Since then there has been no recurrence.

KILLIAN (Freiburg) reports having observed a freely movable osteoma of the nose in a female patient.

26. UFFENORDE (Goettingen): **Two cases of subdural abscess.** Demonstration of macroscopic and microscopic specimens. 1. Case of cured subdural abscess of the middle fossa, complicated with extradural and left temporo-sphenoidal lobe abscess. The brain abscess was at a distance from the purulent focus in the middle-ear. The pathogenic micro-organism was found to be a facultatively anaërobic saprophyte, recognizable by marked foëtor and a marginal zone of marked encephalitis with purulent infiltration. In the after-treatment Uffenorde advises angular glass drains containing a strip of gauze. Persistent aphasia was the only symptom in this case.

2. Almost purely subdural suppuration. Only the part located above the tegmen could be evacuated by crucial incision. Typical symptoms were absent in both cases.

The histological findings were identical in both cases: marked yellowish discoloration of the otherwise smooth, unperforated dura which was surrounded by granulations. The arachnoid was preserved. At post-mortem a second large uncomplicated focus was discovered over the occipital lobe. It was caused by the streptococcus mucosus. Death was due to leptomeningitis.

27. MUELLER (Heilbronn): **Wound retractor for mastoid operations.** Double hook with spring and adjustable claws.

28. HARTMANN (Berlin): **Closure of retro-auricular openings by reclination of the concha.** In the course of operative procedures which lead to the formation of persistent retro-auricular openings, the concha is displaced forwards and outwards. The fistula is located on the exposed surface of the mastoid process which was formerly covered by the

ear. In order to close the opening, the concha must be replaced backward. This is most easily accomplished by excising the scar tissue so as to form a vertical oval with pointed ends, with the fistula at the middle-ear. The upper and lower end of the oval must extend beyond the point of attachment of the level of the auricle, and the anterior and posterior wound margins must be equally distant from the edge of the retro-auricular opening. The edges of the oval wound are then united by sutures. In this way free access is gained to the tympanic cavity, and the disfigurement completely removed.

29. Voss (Frankfurt): **Demonstration of a salpingoscope with attachment for catheter and bougie.** In order to pass a Eustachian catheter or bougie under the guidance of the eye, Voss has modified the salpingoscope of Valentin, which is similar in construction to the cystoscope as arranged for ureteral catheterization. With this instrument a catheter can be introduced into the Eustachian tube and turned in any direction under visual control.

30. KRETSCHMANN (Magdeburg): **Operative treatment of deformities of the nasal septum.** Demonstration of model. The upper lip is turned backward and an incision carried along the line of attachment to the gum from one canine tooth to the other, down to the bone. The upper wound margin is detached from the bone and pushed upward with an elevator, until the lower edge of the piriform aperture appears. The margin of the aperture is then circumcised with a raspatory and the mucous membrane of the floor of the nose and of the septum detached on both sides. The detached mucosa is held out of the way with blunt retractors. The septum is now in full view, bared to the bone, and any procedures necessary can be carried out. The soft parts are then replaced. The flap wound does not need to be sutured. There are generally some fever and œdema of the face in the days immediately following operation. The operation allows inspection and gives plenty of room. The anterior nasal spine and the crista incisiva are often found to be thickened by exostosis and may have to be corrected. The floor of the nose may have to be chiselled down.

31. UFFENORDE (Goettingen): **Pathologic and bacterio-**

logic findings in a case of extensive parietal thrombus of the sinus. Demonstration. Case of purely parietal thrombus of the sigmoid sinus which extended by inflammation of the sinus wall peripherally to the longitudinal and transverse sinuses, and centrally to the internal jugular. The thrombus was so smooth and tough that at the first operation it was mistaken for the inflamed inner wall of the sinus and was not disturbed. The presence of pulmonary metastases was masked for a time by an existing bronchial catarrh of long standing. Chills and bloody sputa led to a correct diagnosis. In the course of several operations the jugular bulb was completely exposed, after Grunert, but more metastases occurred, probably by way of the transverse sinus of the other side. In the jugular bulb operation the field was obscured by free bleeding from a posterior condyloid emissary vein.

The parietal thrombus was rough and nodular. Histological specimens of the vein and the jugular thrombus were presented.

Uffenorde then discussed the pathogenesis of general sepsis on the basis of his clinical experience, the literature, and animal experimentation. He distinguishes four forms:

1. Obstructing thrombus, generally found in acute infection of great virulence.
2. Necrosis of the wall, allowing entrance of large numbers of micro-organisms into the general circulation from the neighboring pus focus.
3. Parietal thrombosis in case of lower virulence, or in chronic cases. In the presence of virulent germs the same kind of thrombus may be caused by reactive inflammation forming a protective wall in the sinus.
4. Direct entrance of germs into the blood without any thrombo-phlebitic process.

Discussion.—RUTTIN (Vienna) believes that Uffenorde's surgical procedures must infallibly lead to general sepsis.

Voss (Frankfurt) claims that the operative course in this case shows the superiority of his procedure over that of Grunert.

UFFENORDE (Goettingen) thinks that the general infection in this case was not to be wondered at, but that the surgical

procedure used was the only one available. Operation by Voss's method would hardly have had any different result.

32. E. URBANTSCHITSCH (Vienna): **Galvanic treatment of the ear.** Demonstration of auditory curves and of an apparatus for auto-therapy. Persistent application in repeated sessions of long-continued currents of low intensity, after the method of Urbantschitsch, senior. This is facilitated by an apparatus which allows the patients to apply treatment themselves. Good results as to tinnitus and hearing.

33. HERSCHEL (Halle): **X-ray examination in decalcification of temporal bones.** Roentgen rays will show the slightest trace of lime salts, and are a valuable aid to determine when decalcification of specimens is complete.

34. HEGENER (Heidelberg): **Thin celloidin sections through the temporal bone.** Demonstration. In order to get sections 10 μ thick through hard bone it is necessary to immerse the specimens in very thin celloidin for a long time, in vacuo, to have a rigid specimen and knife (Jung microtome) and to moisten with alcohol having an alkaline reaction. Various details in regard to the temper of the microtome blade, the form of the block, and the direction of sections, were then given. These thin sections are of use in neurological investigations and for the purposes of micro-photography.

REPORT ON THE PROGRESS IN OTOTOLOGY AND RHINOLOGY DURING THE THIRD AND FOURTH QUARTERS OF 1907.

BY PROF. ARTHUR HARTMANN, BERLIN.

Translated by Dr. ARNOLD KNAPP.

ANATOMY AND PHYSIOLOGY.

627. BIELSCHOWSKY and BRÜHL. On nerve terminations in the membranous labyrinth of vertebrates. *Arch. f. mikr. Anat.*, vol. lxxi.

628. JÜRGENS. The sigmoid sinus in children one and two years of age. *Monatsschr. f. Ohrenhkl.*, 1907, Pt. 8, p. 437.

629. HABERMANN. On changes of the ear in hemicephalia. *Festschr. f. Prof. Dr. Hans Chiari*.

630. LAPYRE. Osseous bullæ at the head of the middle turbinate. *Thèse de Paris*.

631. SCHOENEMANN. On the physiology of normal and hyperplastic tonsils. *Monatsschr. f. Ohrenhkl.*, 1907, p. 179.

627. BIELSCHOWSKY and BRÜHL. *On nerve terminations in the membranous labyrinth of vertebrates.*

These authors have examined the membranous labyrinth in guinea-pigs, monkeys, and human embryos by Bielschowsky's fibrillary method. The previously learned facts concerning the nerve terminations in the labyrinth can be demonstrated with remarkable clearness by this method. A number of new conditions were found which will have to be read in the original.

BRÜHL.

628. JÜRGENS. *The sigmoid sinus in children one and two years of age.*

Anatomic observations on the configuration of the sigmoid sinus in young children.

WITTMACK.

629. HABERMANN. *On changes of the ear in hemicephalia.*

Reports on changes in the ear in anencephalia and hemicephalia are rare. There are only two reports of microscopic examination of the organs of hearing in anencephalia. Habermann had the opportunity of examining the ear in two cases of hemicephalia. The work is characteristic of the careful research of the author. Owing to the non-development of the brain and changes in the form and development of the base of the skull, the development of the internal ear is retarded, partly by pressure and partly by deviation of the position of various parts, causing marked changes in the internal ear.

RÖPKE.

630. LAPYRE. *Osseous bullæ at the head of the middle turbinate.*

This dissertation gives a complete review of bone blisters of the middle turbinate.

OPPIKOFEK.

631. SCHOENEMANN. *On the physiology of normal and hyperplastic tonsils.*

The author opposes Brieger's "protective theory" on the part of the tonsil. He regards the view of the secretory function of the tonsil and its hyperplasia as most improbable. The main function of the tonsil is rather due to the internal cellular activity of the adenoid tissue. The tonsils are to be regarded as subepithelially displaced cervical lymph nodes. The permanent hyperplasia of these organs is a pathological condition which should be operated upon in cases in which the neighboring organs are interfered with.

WITTMACK.

GENERAL.

a.—REPORTS.

632. BURKNER and UFFENORDE. *Report of cases in the University polyclinic of Göttingen for diseases of the nose and ear in the years 1905 and 1906.* *Arch. f. Ohrenhkl.*, vol. lxxii., pp. 50-76.

633. DALLMANN and ISEMER. *Yearly report on the Halle ear clinic, from April 1, 1906, to March 31, 1907.* *Arch. f. Ohrenhkl.*, vol. lxii., pp. 161-204.

634. SCHWARTZE. *Review of the development of the University ear clinic of Halle with statistics of cases and number of students from 1863 to 1907.* *Arch. f. Ohrenhkl.*, vol. lxxii., pp. 11-29.

635. FEER. Influence of consanguinity of parents on the children. *Jahrbuch der Kinderhkl.*, vol. lxvi., Pt. 2.

636. URBANTSCHITSCH. On the relation of naso-pharyngeal lesions to deafmutism. *Monatsschr. f. Ohrenhkl.*, 1907, Pt. 3, p. 115.

632. BURKNER and UFFENORDE. *Report of cases in the Göttingen clinic for diseases of the nose and ear.*

Statistics are given as to the number of cases treated (4638) with details as to age, sex, disease, and operation. Four interesting case histories are described: acute osteomyelitis of the zygoma; infection of the exposed sinus wall, extradural abscess of the cerebellum; plastic covering of bony defects; orbital complications of superior maxillary suppuration, together with three deaths. Bier's hyperemia treatment has given only apparent results and is not favored by the authors because of its possible danger. For the production of analgesia of the nasal mucous membrane a 5% solution of alypin in 1:1000 paraneprhin is suggested.

ZARNIKO.

633. DALLMAN and ISEMER. *Yearly report on the Halle ear clinic.*

The number of dispensary patients has risen to 3282. In addition to statistic data there is one case history: extensive cholesteatoma with sinus thrombosis; removal of polypi from the meatus, radical mastoid operation, ligation of the jugular vein, operation on the sinus, operation on the jugular bulb with injury to the vagus; recovery. There are some remarks on three other interesting cases—rupture of the drum membrane from a box on the ear, pyæmia, recovery; two cases of otitic temporal lobe abscess. Report on ten deaths during the year.

ZARNIKO.

634. SCHWARTZE. *Review of the development of the University ear clinic of Halle with statistics of cases and number of students from 1863 to 1907.*

The growth of this clinic is given in the classical language of the authors. The clinic began as an annex with 145 patients; in 1896-7 there were 318 indoor and 3282 dispensary patients. During the year of the report there were 246 fatal cases, of which 191 were due to ear diseases. Most of the fatal cases were due to intracranial complications

following otitis. From April 1, 1884, to April 1, 1907, 2314 operations on the mastoid were performed. During the last ten years there were 481 simple and 960 radical mastoid operations performed. A list of the assistants who have been active in the clinic is given. The number of students who have attended the courses, as well as a complete chronological list of all of the literary publications of the directors and students, end the paper. ZARNIKO.

635. FEER. *Influence of consanguinity of parents on the children.*

The relationship of consanguinity of the parents to the children is studied with reference to mental diseases, idiocy, retinitis pigmentosa, and deafmutism. The author concludes that certain morbid predispositions such as retinitis pigmentosa and congenital deafmutism acquire increased hereditary tendency if they are present in the family of both parents. HARTMANN.

636. URBANTSCHITSCH. *On the relation of naso-pharyngeal lesions to deafmutism.*

The author finds that most deafmutes suffer from chronic catarrhal middle-ear processes, that many of them show chronic pharyngitis, and that there is generally a tendency to hyperplasia of the lymphatic tissue of the naso-pharynx. In none of the cases operated upon for adenoids was the deafmutism improved; nevertheless, the general condition and the catarrh of the nose and the nasopharynx were favorably influenced. WITTMACK.

b.—GENERAL PATHOLOGY AND THERAPEUTICS.

637. BLEGVAD. *On the action of the use of the telephone on the body in general, with especial reference to the ear.* *Arch. f. Ohrenhkl.*, vol. lxxi., pp. 111-117, 205-237; vol. lxxii., pp. 30-50, 205-252.

638. BEZOLD. *The escape of the labyrinth water and its effect on the function of the ear.* *Zeitschrift f. Biologie*, vol. xlviii.

639. PASQUIER. *Traumatism of the ear during manual labor.* *Thèse de Paris*, 1906.

640. JÜRGENS. *Affections of the ear, nose, and throat following the explosion of bombs and firearms.* (Continuation and conclusion.) *La presse otolaryn.*, 1907, Pt. 10.

641. FREY. *The so-called reflex epilepsy following disease of the ear and nasopharynx.* *Wiener med. Presse*, No. 28, 1907.

642. STEIN. A case of extremely slow respiration of nasal origin. *Russische Monatsschr. f. Ohrenhkl., etc.*, October, 1907.

643. SCHAPIRO. On the influence of difficult nasal respiration on the morphological condition of the blood, respiration, and circulation. *Dissertation Moskau*, 1907.

637. BLEGVAD. *On the action of the use of the telephone on the body in general, with especial reference to the ear.*

This extensive paper begins with a critical review of everything which has been published on the subject. The author's investigations consisted in the examination of 450 telephone operators. In all of those examined, not only was the condition of the ears carefully noted, but especial attention was paid to nervous and other general disturbances which might be referable to the use of the telephone. In 26.4% of the 371 telephone operators with normal hearing, a retraction of the drum was found on the side used in telephoning; the other ear was usually normal. It seems, therefore, quite probable that this anomaly was directly or indirectly caused by the use of the telephone. The use of the telephone as a profession does not cause a diminution of hearing in individuals with normal hearing, nor, on the other hand, is there any proof that acuity of hearing is increased thereby as is often believed by telephone operators. It is probable that in the course of time the ear becomes accustomed to the use of the telephone and the transmitted voice is better perceived. It is not proven that the regular use of the telephone exerts an unfavorable influence on ear disease, although there are instances where lightning, or very sudden loud noises during the use of the telephone, have aggravated ear disease, or have caused it. It is therefore advisable that only individuals with normal ears be employed for telephoning. In a few cases, and generally in individuals nervously disposed, the use of the telephone has caused headache and subjective ear disturbances, as pain, tinnitus, pressure, feeling of fulness in the head, hyperesthesia acoustica. Some of these symptoms have their origin in general nervousness which is brought about by the usual conditions of this pursuit. Anæmic, nervously disposed persons should not be employed. Severe disturbances to the ear from lightning or short circuit have not been observed by the author up to the present time.

Some harmful results have followed the use of the so-called "head-telephone"—acne of the external ear, itching of the ear, eczema, otomycosis, etc. The head-telephone, moreover, cannot be removed as quickly as the hand-telephone in the event of sudden, unexpected loud noises, and is, therefore, more dangerous. ZARNIKO.

638. BEZOLD. *The escape of the labyrinth water and its effect on the function of the ear.*

In the introduction Bezold gives a review of the present status of the functional examination of the human ear. He regrets that in the reports of cases of operative opening of the labyrinth, the condition of the hearing before and after the operation is so briefly and incompletely given; at the same time the author acknowledges that in many of these cases the results of examination are not suited for physiological deductions on the hearing function. Even in uncomplicated puncture injuries of the labyrinth, no definite deductions can be given as to the rôle of the labyrinth water in sound transmission. The author cites a case in point. On very careful and exact functional examination he decides that the release of the endolymphatic spaces, through the escape of the perilymph at Corti's organ, is not functionally injurious in its action. The very interesting results of his examination should be read in the original. RÖPKE.

639. PASQUIER. *Traumatism of the ear during manual labor.*

Under the guidance of Castex this dissertation treats of the injuries of the external, middle, and internal ear. Not all of the 40 case histories prove that the changes in the drum and the reduction in hearing were actually the result of trauma. It is not stated how important it is that these accident cases should be immediately examined by a specialist and not only after waiting weeks or months.

OPPIKOFEK.

640. JÜRGENS. *Affections of the ear, nose, and throat following the explosion of bombs and firearms.*

Group II. treats of 4 cases of injuries of the ear and mastoid process with firearms. In the first 3 cases the wounds healed without changes in the mastoid process, while in the fourth

there is a large hematoma in the bone which prevents the formation of granulations. The tolerance of the tissues of the skull and of the neck to relatively large bullets is remarked. Group III. represents injuries of the superior maxillary by firearms, which heal readily. Group IV.—injury of the larynx with firearms; paralysis of the recurrent nerve.

BRANDT.

641. FREY. *The so-called reflex epilepsy following disease of the ear and nasopharynx.*

The author endorses Binswanger's definition of reflex epilepsy. There then follows a consideration of a number of cases in the literature. Of 112 cases which the author examined, 16 were true cases; of these, 4 were treated with positive results. The author also made animal experiments on guinea-pigs which had been rendered epileptic according to the Braun-Sequard method by the enclosure of various foreign bodies in the ear and nasopharynx, also other irritations, and found that they resulted positively. This form of irritation has, so to speak, the same epileptic action as external trigeminal irritations. In view of their clinical observations and experiments, the authors conclude that children and individuals who through infantile cerebral disease, chronic toxemia, injuries to the head, or other injuries, have a predisposition toward epilepsy, are rendered more prone to epileptic attacks by diseases and foreign bodies in the ear, nose, and throat than by other peripheral irritants.

WANNER.

642. STEIN. *A case of extremely slow respiration of nasal origin.*

A girl, eleven years of age, with pronounced hypertrophic rhinitis and adenoid vegetations which occluded the choanæ to one third of their extent. A year and a half ago the child suffered from sighing which gradually increased. The number of individual sighs was five to the minute. After each excitement the sighing became more frequent and was followed by a cessation of respiration with threatened asphyxia. Ordinary respiration of the child required the aid of all the accessory muscles. The tip of the nose became cyanotic. During sleep the deep sighing ceased, but on awakening the

respiration became slow and gradually the sighing began. After removal of the adenoids and relief of the hypertrophy of the inferior turbinate, breathing became normal.

SACHER.

643. SCHAPIRO. *On the influence of difficult nasal respiration on the morphological condition of the blood, respiration, and circulation.*

The examination of the blood in 130 children from three to seventeen years old, suffering from adenoids, showed that in those suffering from difficult nasal breathing the number of red blood corpuscles was diminished, while the leucocytes were increased. Of the cases operated upon in 57 the blood was again examined one month after operation, and it was found that the number of red blood corpuscles was not greatly influenced. The number of leucocytes diminished one month after operation. Experiments on dogs showed:

1. After complete occlusion of the nose in young dogs for some time, the autopsy revealed pronounced emphysema.

2. After complete closure of the nose in young dogs the red blood corpuscles, leucocytes, and hemoglobin were increased.

3. After packing the nose in dogs the number of respirations becomes less frequent, the excursions of the thorax greater, the diaphragm sinks, and the pressure in the trachea becomes greater.

4. After complete occlusion of the nose in dogs the pressure in the arteries and peripheral veins is increased, while the pressure in the right ventricle is decreased.

5. Unilateral occlusion of the nose has no influence on the circulation or respiration.

6. All of these symptoms can be explained by the insufficient admission of air to the lungs.

SACHER.

C.—METHODS OF EXAMINATION AND TREATMENT.

644. DOLGER. *How is it possible to make a diagnosis of simulation in the functional examination, and how can we obtain the best idea of the amount of hearing present?* *Münch. med. Wochenschr.*, 1907, No. 31.

645. BÜRKNER. On alypin in otology. *Berlin klin. Wochenschr.*, No. 14, 1907.

646. HARTMANN. The use of perborate of sodium in the treatment of the ear, nose, and throat. *Deutsche med. Wochenschr.*, No. 38, 1907.

647. LEUTERT. Bier's congestion treatment in otology. *Deutsche med. Wochenschr.*, No. 31, 1907.

644. DOLGER. *How is it possible to make a diagnosis of simulation in the functional examination, and how can we obtain the best idea of the amount of hearing present?*

Dolger emphatically states that the functional examination is the best means for unmasking the simulation, and gives tests which must be read in the original. In the examination with speech it must be remembered that the simulator will often make the appropriate lip movements. On giving two numbers the simulator will often repeat only one, while the confounding of numbers which is characteristic of the deaf never occurs. To obtain an idea of the amount of hearing present the author suggests examining with the face turned alternately away from and towards the patient.

SCHEIBE.

645. BÜRKNER. *On alypin in otology.*

Bürkner has used alypin anæsthesia in paracentesis, incision of furuncles, and minor operations in the tympanic cavity with satisfaction.

MÜLLER.

646. HARTMANN. *The use of perborate of sodium in the treatment of ear, nose, and throat.*

Instead of Bezold's boric acid, Hartmann has used perborate of sodium which is put up by Merck of Darmstadt. This sodium preparation works excellently in all catarrhal, suppurative, and ulcerative diseases of the mucous membrane in the ear and upper respiratory passages. Its use is practically always painless although in laryngeal tuberculosis it may irritate if used in too large quantities. According to Hartmann the disinfecting action of this remedy is due to the peroxide of hydrogen, and culture experiments by Dr. Topfer have shown that the perborate powder will retard the development of staphylococci and typhoid bacilli. A new powder blower is also described.

NOLTENIUS.

647. LEUTERT. *Bier's congestion treatment in otology.*

The author bases his remarks on the papers which have appeared on this subject and concludes as follows:

1. Congestion treatment is useless in chronic middle-ear suppuration, but may be indicated in certain acute forms of mastoid suppuration.

2. Congestion before the evacuation of pus from the mastoid process is dangerous for the sinus and should only be employed when the patient is under close observation in a hospital.

3. In the severe forms of otitis which follow scarlet fever and measles congestion should be employed with caution.

4. Recent cases are only adapted to test the treatment if without the use of congestion they would presumably have led to operation in a few days.

5. The previously accepted treatment—in the beginning of the disease to lessen the fever and relieve the pain by paracentesis—cannot be replaced by congestion hyperemia.

NOLTENIUS.

EXTERNAL EAR.

648. FALLAS. Keloid of the lobe of the ear. *La presse otolaryn.*, 1907, Pt. 9.

649. UFFENORDE. On plastic operation for deformities of the auricle. Report of a useful method in cases of microtia. *Munch. med. Wochenschr.*, 1907, No. 43.

650. BAUROWICZ. Keratosis obturans. *Monatsschr. f. Ohrenhkl.*, 1907, Pt. 7, p. 395.

651. TROFIMOW. The surgical treatment of adhesions in the external auditory canal. *Russische Monatsschr. f. Ohrenhkl.*, July, 1907.

652. BALL, BARRY J. Pulsating growth in the left external auditory meatus. *Proceedings of the Royal Society of Medicine, Otol. Sec.*, vol. i., No. 5, 1908, p. 32.

653. LYDSTON, G. F. Case of pugilist's ear. *Surg. Gynecol. and Obstet.*, October, 1907.

648. FALLAS. *Keloid of the lobe of the ear.*

Following perforation of the lobule in a little girl, small round tumors developed around the aperture making the wearing of earrings impossible. Treatment by thiosinamine was without any result.

BRANDT.

649. UFFENORDE. *On plastic operation for deformities of the auricle. Report of a useful method in cases of microtia.*

Report of a bilateral operated case. The method must be read in the original. SCHEIBE.

650. BAUROWICZ. *Keratosi obturans.*

The disease described by the author as keratosi obturans is that which is generally known as cholesteatoma of the external auditory canal or epidermis plug.

WITTMAACK.

651. TROFIMOW. *The surgical treatment of adhesions in the external auditory canal.*

The author finds that the crucial incision is indicated only in membranous occlusion in the cartilaginous or bony parts of the auditory canal, if it does not measure more than 3mm. In fibrous occlusion of the cartilaginous portion the best method consists in dilatation of the bony canal according to the type of radical trepanning, removal of the cicatrix from the posterior wall, and suture of the remaining flap posteriorly. In congenital atresia operative treatment is without value.

SACHER.

652. BALL, BARRY J. *Pulsating growth in the left external auditory meatus.*

A reddish, pulsating growth, which had first been noticed ten years previously, had been gradually increasing in size until it filled the meatus and protruded slightly from the orifice. The pulsation was communicated to the auricle and region in front of it. The attachment was deep within the meatus and could not be made out as manipulations caused hemorrhage. The growth was presumably angiomatous in nature. No operative treatment was advised.

HUNTER TOD.

653. LYDSTON, G. F. *Case of pugilist's ear.*

The auricle was found to be greatly distorted and thickened, the concha and auditory meatus being filled with cartilaginous tumors almost of the density of bone. The average thickness of the auricle was over three-quarters of an inch. Subcutaneous resections of the cartilaginous over-growth,

with due regard to the normal anatomical configuration of the auricle, brought about a most satisfactory result.

CLEMENS.

MIDDLE EAR.

a.—ACUTE OTITIS.

654. BLUM. Otitis media in children. New and practical point in diagnosis; bacterial investigations. *California State Med. Jour.*, October, 1907.

655. HOLMES, C. R. Hysteria of the ear. *Laryngoscope*, August, 1907.

656. KERRISON, P. D. The Eustachian tubes in infants and young children; anatomic differences as compared with the adult type; bearing upon tympanic disease. *Laryngoscope*, September, 1907.

657. SHEPPEGRELL. Prevention of deafness. *N. Y. Med. Jour.*, September 7, 1907.

658. KYLE, JNO. J. Report of a case of acute suppuration of the middle ear, mastoid process, and labyrinth, due to Klebs-Loeffler bacillus. *Indiana Med. Jour.*, September, 1907.

659. REINHARD. Case of gonococcic otitis. *Monatsschr. f. Ohrenhkl.*, 1907, p. 436.

660. MÖLLER. Otitic osteomyelitis of the level cranial bones. *Hospitalstidende*, No. 50, 1907.

661. GORDING. Mastoid resection in displaced sigmoid sinus. *Norsk mag. f. lag.*, 1907, p. 1285.

662. MOSKALEW, M., and TROFIMOW. The etiology of suppuration of the mastoid process and its clinical appearances. *Russische Monatsschr. f. Ohrenheilk, etc.*, August, 1907.

663. BAILLEZ. Dental pain consecutive to lesion of the facial nerve after mastoid operation. *La presse otolaryngol.*, 1907, Pt. 10.

654. BLUM, S. Otitis media in children. New and practical point in diagnosis; bacterial investigations.

Blum found on placing the finger behind the angle of the jaw on the affected side in the groove formed by the inferior maxillary bone and the anterior border of the sternomastoid, and pressing upwards toward the auditory canal, decided evidences of pain were elicited. It is constant in otitis media and is of special value in infants though it does not suffice in itself for a positive diagnosis.

CLEMENS.

655. HOLMES, C. R. *Hysteria of the ear.*

The subject is carefully classified and the various divisions are discussed in detail. The author takes occasion to protest

against the propriety of undertaking or pretending to undertake an operation on the ears of such patients for the purpose of the mental effect, as such a course only confirms the belief in the reality of the hysterical symptoms and paves the way for fresh delusions.

CLEMENS.

656. KERRISON, P. D. *The Eustachian tubes in infants and young children; anatomic differences as compared with the adult type; bearing upon tympanic disease.*

The author believes that, when a pharyngeal growth is clearly a factor in acute tympanic disease, the removal of the growth and incision of the drum membrane should be done at the same time. This does not mean, however, that in every case of acute otitis media we should search the nasopharynx for evidences of lymphoid hypertrophy, but when such growth is clearly a hindrance to tympanic resolution, the acute stage offers a favorable time for its removal rather than a contraindication thereto.

CLEMENS.

657. SHEPPEGRELL. *Prevention of deafness.*

An examination of 11,855 cases of disease of the nose, throat, and ear, showed that 2284 cases (about 20%) had defective hearing. In children dulness and inattention were often charged when a slight deafness was at fault. The author urges a systematic testing of the hearing of school children so the defective hearing may be discovered and promptly remedied.

CLEMENS.

658. KYLE, JNO. J. *Report of a case of acute suppuration of the middle ear, mastoid process, and labyrinth, due to Klebs-Loeffler bacillus.*

Patient, aged fifty, complained of severe pain in the right ear which had continued uninterruptedly for two months. The membrana tympani was found to be intact, bulging, and white; no swelling in auditory canal or over mastoid process. Myringotomy released a thick yellowish pus from the middle ear without relieving the pain. The mastoid was opened a week later, and a culture of the pus found there disclosed the presence of the Klebs-Loeffler bacillus. The true character of the disease was finally discovered through

the occurrence of the nurse in attendance coming down with a severe attack of nasopharyngeal diphtheria.

The patient had had a well-defined attack of pharyngeal diphtheria some weeks before the ear became affected, and the infection doubtless extended to the middle ear through the Eustachian tube. CLEMENS.

659. REINHARD. *Case of gonococcic otitis.*

A child of fourteen years who was suffering from gonorrheal ophthalmia developed a discharge from the right ear; the discharge was profuse and creamy white. On acetic-agar Gram-negative diplococci were found. After anti-gonorrheal treatment—consisting of irrigations of permanganate of potash 1:5000, and instillations of 1% protargol, rapid healing was brought about. WITTMACK.

660. MÖLLER. *Otitic osteomyelitis of the level cranial bones.*

General review of the clinical picture of otitic osteomyelitis, including the publication of a personal case.

MÖLLER.

661. GORDING. *Mastoid resection in displaced sigmoid sinus.*

After a review of the pertinent literature in which the noteworthy investigations of Schonemann are not regarded, it is stated that during ten years in the University Ear Clinic of Christiania 674 mastoid operations were done; in 34 cases displaced sinus was found, 22 times on the right side and 12 times on the left. In one case the sinus was directly contiguous to the posterior canal wall. No mention is made of the shape of the skull. MÖLLER.

662. MOSKALEW, M., and TROFIMOW. *The etiology of suppuration of the mastoid process and its clinical appearances.*

Bacteriological examination of the pus, granulations, and bony splinters from the cells of the mastoid process was made. In 130 cases of mastoiditis streptococci in clear culture were found in 88%; in 22% a mixture of streptococcus and staphylococcus albus. SACHER.

663. BAILLEZ. *Dental pain consecutive to lesion of the facial nerve after mastoid operation.*

The author has observed pain in the teeth in patients who during a mastoid operation have had the facial nerve injured. There was a heavy, continuous pain in the teeth of the upper and lower jaws on the side of the operation, especially when the jaws were approximated in chewing. There were no inflammatory symptoms although the teeth were tender. The pain is caused by the facial nerve, which, although it is primarily motor, contains many sensory fibres obtained from the intermediate portion of the nerve of Wrisberg, the glosso-pharyngeal, the auriculo-temporal, the cervical plexus, and the trigeminus. The pain usually passes away in a few days.

BRANDT.

b.—CHRONIC OTITIS.

664. THEOBALD, SAMUEL. *The conservative treatment of chronic suppuration of the middle ear.* *Jour. Am. Med. Assn.*, Nov. 23, 1907.

665. BRYANT, W. SOHIER. *Cleansing treatment of chronic suppuration of the middle ear.* *Jour. Am. Med. Assn.*, September 14, 1907.

666. REIK. *When shall we advise tympanomastoid exenteration in the treatment of suppurative otitis media and in what per cent. of cases may we expect a cure?* *Am. Jour. Med. Sciences*, August, 1907.

667. PREOBRAHENSKY. *The aspiration treatment of otorrhea.* *Monatsschr. f. Ohrenhkl.*, 1907, p. 402.

668. HALASZ. *On the extraction of the ossicles by Neumann's method.* *Monatsschr. f. Ohrenhkl.*, 1907, Pt. 4, p. 212.

669. BEZOLD. *The elimination of a labyrinth sequestrum in a phthisical patient following cauterization of the tympanum.* *Arch. internat. d'otol., etc.*, vol. xxiv., p. 1.

670. HEINE. *On labyrinth suppurations.* *Deutsche med. Wochenschr.*, No. 32, 1907.

671. WEST and SCOTT. *Operative surgery of labyrinthitis based on an experience of thirty cases.* *Proceedings of the Royal Society of Medicine, Otological Section*, vol. i., No. 6, 1908, p. 37.

672. RICHARDS, J. D. *Surgery of the labyrinth.* *Laryngoscope*, October, 1907.

664. THEOBALD, SAMUEL. *The conservative treatment of chronic suppuration of the middle ear.*

Constitutional treatment is as important as local measures. Apart from nasal operations, surgical work on the ear is seldom called for unless there is mastoid involvement. The

use of antiseptic solutions is advocated in place of powders, bichloride of mercury and boric acid being the most useful in the author's hands. Any concurrent nasal disease or systemic condition on which the ear trouble may depend must be treated. The cases least amenable to treatment are not those with extensive destruction of the drum, but where there is a small perforation in the membrana flaccida. If the drainage is free antral disease disappears when the tympanic trouble is controlled. The administration of pyrophosphate in liberal doses is strongly recommended.

CLEMENS.

665. BRYANT, W. SOHIER. *Cleansing treatment of chronic suppuration of the middle ear.*

If the drainage in chronic suppuration of the middle ear is sufficient and there are no collections of inspissated material, dry wiping followed by application of boric acid powder gives rapid results. Where there is a collection of cheesy matter within the tympanum the use of the intratympanic syringe is found of much service, but should its application fail the employment of suction is recommended. Should an area of caries be found treat it by cleanliness and *stimulate* any accumulation of granulations with nitrate of silver. After these means of treatment the ear usually becomes clean and sweet, but in a certain number of cases serous discharge continues. To overcome this all unnecessary irritation of the tympanum must stop and use astringents, either dry or in solution. Powders of boric acid and xeroform bismuth tribrom-phenolate are considered of value. When relapses occur they are treated according to the indication the ear presents at the time.

CLEMENS.

666. REIK, H. O. *When shall we advise tympanomastoid exenteration in the treatment of suppurative otitis media and in what per cent. of cases may we expect a cure?*

The author believes when it becomes evident that the usual simple measures and minor operations cannot cure the disease in question, tympanomastoid exenteration should be advised unless in a given case there exists some special reason of socio-economical character that justifies delay.

The percentage of cures in obstinately chronic cases is estimated approximately at 70%. CLEMENS.

667. PREOBRAHENSKY. *The aspiration treatment of otorrhæa.*

See 556.

668. HALASZ. *On the extraction of the ossicles by Neumann's method.*

The author has employed Neumann's method with satisfaction in a number of cases. WITTMACK.

669. BEZOLD. *The elimination of a labyrinth sequestrum in a phthisical patient following cauterization of the tympanum.*

Bezold has already published 13 cases of labyrinth necrosis; in this paper an additional 14th case is reported. The ear was carefully examined as well as the function of the vestibular apparatus. The removed sequestrum corresponded to the promontory wall; it extended upwards to the margin of the oval window, so the facial nerve was not involved. The course of the disease showed that the cauterization undertaken by another physician was the cause of the sequestration. Bezold, therefore, warns against cauterization by chemical means or with the galvano-cautery wire and insists that granulations should only be removed with the snare or curette. OPPIKOFER.

670. HEINE. *On labyrinth suppurations.*

After a short anatomic description of the labyrinth, the mode of production of labyrinth suppuration, together with diagnostic points, is given. Finally there is a short description of the methods of operating. Heine, in view of the fact that at the Berlin Ear Clinic fistula of the horizontal semicircular canal was so frequently observed (207 times in 277 cases of labyrinth suppuration), insists upon the importance of this region as a site for the development of purulent labyrinth disease. The difficulties of diagnosis are mentioned, which, notwithstanding the painstaking efforts of v. Stein, Wanner, Kümmel, Hinsberg, Bárány, and others, are still great, and in many cases it is only at the operation that the site and extent of the disease are discovered. The author leaves a defect in the horizontal semicircular canal

untouched, even when nystagmus and vertigo are present, as the defect sometimes heals spontaneously, and the danger is always present that the operation may convert a circumscribed inflammation of the labyrinth into a diffuse one. The labyrinth, however, should be opened when before the operation it is found that the vestibular apparatus can no longer be excited, or when labyrinth symptoms do not disappear after operation, but on the other hand become aggravated or appear for the first time; even in those cases where the site of the perforation of the labyrinth has not been demonstrated and every other cause for the labyrinth symptoms can be excluded.

NOLTENIUS.

671. WEST and SCOTT. *Operative surgery of labyrinthitis based on an experience of thirty cases.*

After reference to the work of other operators, the authors give a minute description of the anatomy of the labyrinth, of the morbid appearance, and particularly of the paths of infection. In nine of the thirty cases, no "labyrinthine" symptoms were present, but in most instances vertigo, vomiting, and deafness were marked. Tinnitus was only complained of in three, severe deep-seated pain in the ear in four, and headache in four cases. The temperature and pulse were in no case characteristic and spontaneous nystagmus was not observed.

The authors consider that the labyrinth should always be operated on if an affected labyrinthitis could be diagnosed.

With regard to results: in every case in which vertigo was present at the time of operation, the patient was completely relieved. In no case was useful hearing present at the time of operation, but in the majority the hearing power was already defective or absent before operation. In no case was there permanent facial paralysis as the result of operation. Although there was a mortality of 17%, in only 3% was the operation considered the actual cause.

This paper can only be appreciated if read in extenso.

HUNTER TOD.

672. RICHARDS, J. D. *Surgery of the labyrinth.*

In a very comprehensive article illustrated by sixteen

colored plates, the author demonstrates in a series of eleven cases the unreliability of labyrinthine localization. He found the horizontal semicircular canal, either alone or in combination with other lesions of the capsule, involved in nine; the oval window was perforated in five; the promontory, or first cochlear whorl in one; the labyrinthine capsule in the solid angle of the semicircular canals in one; the inner vestibular wall in one. In all there were seventeen perforations in the eleven cases, sixteen through the outer labyrinthine wall, and one through the inner. The route selected for the entrance of the labyrinth is posterior to the facial nerve, the point being the solid angle of the semicircular canals. Great care must be taken that the chisel does not cross the cavity of the vestibule and impinge upon its inner wall. Should this wall be fractured the cerebro-spinal fluid will be lost, which aside from the inconvenience may jeopardize the patient's life. Sterile wax should be used to plug the rent. Large quantities of sugar and acetone may appear in the urine after this operation. In three cases where the major portion of the labyrinth was removed, including the semicircular canals, there appeared to be after a lapse of over two years in the first, one year in the second, and nine months in the third, no sign of muscular atrophy of either side of the body.

CLEMENS.

C.—CEREBRAL COMPLICATIONS.

673. BEVER. The ways of extension of middle-ear suppurations to the brain and the development of cerebral abscesses. *Dissert.*, Erlangen, 1907.

674. RABOTNOW. Statistics of otitic intracranial complications according to Russian authors. *Russische Monatsschr. f. Ohrenhkl., etc.*, June, 1907.

675. SIEUR. Three cases of cerebral abscess and remarks on the surgical treatment of endocranial otitic complications. *Arch. internat. d'otol., etc.*, vol. xxiv., p. 16.

676. DE CELIO-CEYA. Cases of difficult differential diagnosis from practice (left-sided cerebral abscess of otitic origin in the temporal lobe). Malarial epileptoides. *Wiener klin. therapeutische Wochenschr.*, No. 32, 1907.

677. WICART. Abscess of the spheno-temporal lobe of otitic origin. *Thèse de Paris*, 1906.

678. BROSCIOWSKI. Cerebral abscess of otitic origin. Operation. Recovery. *Wiener med. Presse*, No. 28, 1907.

679. VIGARD and SARGNON. Otitic intracranial complications. *Arch. internat. d'otol., etc.*, 1907, No. 6.

680. CHEVAL. Injury of the meninges of the brain and the lateral ventricle after a foreign body had entered the ear. Meningitis; operation; recovery. *La presse otolaryn.*, 1907, Pt. 8.

681. POTTS, BARTON H. Report of a case of septic meningoencephalitis or cerebritis. *N. Y. Med. Jour.*, Sept. 21, 1907.

682. BLACK. Cerebellar abscess following acute suppuration of middle ear. *Laryngoscope*, July, 1907.

683. PATERSON, D. R. Crossed abducens paralysis in a case of cerebellar abscess. *Proceedings of the Royal Society of Med., Otol. Section*, vol. i., No. 6, 1908, p. 88.

673. BEVER. *The ways of extension of middle-ear suppurations to the brain and the development of cerebral abscesses.*

A description of the methods of extension based on the literature is given, also two cases of otitic temporal lobe abscess which were observed in Bezold's clinic. One case is noteworthy because the pus extended into the cranial cavity through the intervention of a dehiscence in the tegmen tympani; the second case is remarkable because a right-sided abscess caused aphasia and paraphasia. The patient was left-handed for heavy work though he used his right side for writing.

HARTMANN.

674. RABOTNOW. *Statistics of otitic intracranial complications according to Russian authors.*

The statistic data include 504 cases and the results are about the same as for other European authors. The only deviation may be in the fact that in the cases of Russian authors the intracranial complications appear to occur more frequently on the left side. A case of interest is that of sarcoma of the temporal bone in a woman who had suffered from chronic purulent otitis.

SACHER.

675. SIEUR. *Three cases of cerebral abscess and remarks on the surgical treatment of endocranial otitic complications.*

Histories are given of three cases of abscess of the temporal lobe, one following acute otitis, two chronic otitis. The difficulties of diagnosis and indications for operation are discussed.

OPPIKOFER.

676. DE CELIO-CEYA. *Cases of difficult differential diagnosis from practice (left-sided cerebral abscess of otitic origin in the temporal lobe). Malaria epileptoides.*

A man, thirty-four years of age, who had been suffering with malaria was taken ill with high fever, chills, sweats, and vomiting. The left drum presents a picture of an old, chronic middle-ear process but without any discharge. The symptoms were not influenced by quinine. After two days convulsions set in. The same symptoms were presented every year by a number of cases of atypical malaria—the so-called malaria epileptica. The examination of the blood revealed a leucocytosis, a variation in form of the red blood corpuscles, poikilocytosis, reddish-brown granular pigment enclosed in some of the blood corpuscles. At autopsy there was an abscess filled with thick, purulent, green pus, which communicated with the petrous bone where the bone was softened and carious. The temporal bone was not concerned.

WANNER.

677. WICART. *Abscess of the spheno-temporal lobe of otitic origin.*

In this dissertation four cases are described and the symptoms and treatment of otitic temporal lobe abscess are given. There is nothing new. There is also a case of thrombosis of the cavernous sinus, two cases of purulent meningitis of otitic origin, and a case of hysteria which simulated otitic abscess.

OPPIKOFER.

678. BROSCHNIOWSKI. *Cerebral abscess of otitic origin. Operation. Recovery.*

A case of acute otitis (left) in which the temperature only rose three times to 38° C. The suppuration was soon cured but severe headache followed. After six or eight weeks loss of consciousness; ten days later operation. The drum was slightly reddened and cloudy, otherwise normal. No pus could be found in the mastoid, but the antrum and tegmen tympani were softened and hyperemic. The dura was exposed to the extent of 4cm and after incision three tablespoonfuls of pus were evacuated. The abscess cavity was curetted and drainage tube put in. On the following day

complete return to consciousness. The abscess was closed in two weeks and the function of the nervous system became normal. Because of the possibility of acute suppuration the radical operation was performed. WANNER.

679. VIGARD and SARGNON. *Otitic intracranial complications.*

The authors give the histories of 6 cases of extra-dural otitic abscess, some of them with sinus thrombosis; they also cite 2 cases of serous meningitis and 1 case of temporal lobe abscess, the latter in a three-year-old child. The abscess was found at operation; the patient died of purulent meningitis. Finally the histories are given of 5 severe cases of cholesteatoma, in which 2 led to intracranial complications.

OPPIKOFER.

680. CHEVAL. *Injury of the meninges of the brain and the lateral ventricle after a foreign body had entered the ear. Meningitis; operation; recovery.*

The title gives the contents of this short paper. BRANDT.

681. POTTS, BARTON H. *Report of a case of septic meningoencephalitis or cerebritis.*

The unusual feature of this case was the duration of the condition without pus formation notwithstanding the presence of suppuration in the ears and mastoids. The autopsy showed some injection of the pia and dura, plastic exudate at the base, considerable hemorrhage about the site of operation and along the lines of the punctures; brain markedly cedematous, ventricles normal, an absence of pus. The condition confirms the diagnosis, septic in origin and doubtless superimposed by his alcoholic excesses. CLEMENS.

682. BLACK, W. D. *Cerebellar abscess following acute suppuration of middle ear.*

The mode of infection in this case seemed to be through the lymphatics, as the sigmoid sinus and the osseous walls about it were healthy. The abscess was about the size of a hickory nut and contained about one-half an ounce of thick greenish pus, and situated about the centre of the lateral

lobe. There was no apparent connection with the lateral sinus.

CLEMENS.

683. PATERSON, D. R. *Crossed abducens paralysis in a case of cerebellar abscess.*

A case of cerebellar abscess on the right side, the result of chronic middle-ear suppuration. The cerebellum was explored in front of the lateral sinus; the abscess found and drained. An uninterrupted recovery took place. Before operation there was optic neuritis on both sides and distinct weakness of the left external rectus which gradually developed into a definite squint. After operation the eye symptoms gradually disappeared.

HUNTER TOD.

d.—DISEASES OF THE SINUS.

684. NÜRNBERG. The value of negative results of bacteriological examination of sinus blood in the differential diagnosis between otitic sinus thrombosis and other obscure febrile conditions. *Münch. med. Wochenschr.*, 1907, No. 51.

685. GROSSMANN. Primary otitic thrombosis of the bulb of the internal jugular vein. *Arch. f. klin. Chirurgie*, vol. lxxxv., Pt. 1.

686. UHTHOFF. On the eye symptoms of thrombosis of the cerebral sinus. *Monatsschr. f. Psychiatrie u. Neurol.*, 1907, p. 383.

687. UCHERMANN. A case of fatal venous hemorrhage from the ear in a nursling. *Norsk mag. f. lag.*, 1907, p. 1425.

688. HOFER. Case of otitic sinus thrombosis in acute purulent otitis. *Wiener med. Wochenschr.*, No. 33, 1907.

689. TOD, HUNTER. Lateral sinus thrombosis; subsequent meningitis (meningitis serosa); recovery. *Proceedings of the Royal Society of Medicine, Otol. Section*, vol. i., No. 5, 1908, p. 30.

684. NÜRNBERG. *The value of negative results of bacteriological examination of sinus blood in the differential diagnosis between otitic sinus thrombosis and other obscure febrile conditions.*

This is a report from Leuter's clinic of a case of chronic purulent otitis which ran a very high fever and which on puncture of the sinus gave sterile blood. The further course showed that erysipelas was the cause of the fever. At a second puncture bacteria were found, but the needle penetrated a part of the sinus which had been in contact for two days with pus in the mastoid process. It is therefore important that a puncture should only be undertaken in a freshly

exposed region as near as possible to the bulb, otherwise a thrombus in the latter region may be overlooked. Leuter's blood examinations which are well known to the readers are mentioned.

SCHEIBE.

685. GROSSMAN. *Primary otitic thrombosis of the bulb of the internal jugular vein.*

Primary thrombosis of the jugular bulb is only relatively infrequent; in every four to six cases of otitic pyæmia it occurs at least once. Contrary to the view of Leutert and Grunert contact thrombosis is more frequent than that caused by embolism. Peribulbar abscess is sometimes the cause and sometimes the result of bulb thrombosis. Primary abscess is sometimes the cause and sometimes the result of bulb thrombosis. Primary parietal bulb thrombosis is always only a diagnosis of probability. In secondary bulb thrombosis, after the removal of the infecting thrombus from the sigmoid sinus, recovery occurs with or without ligation of the jugular vein. In primary bulb thrombosis, when continuous high fever in the course of an acute, especially in subacute, rarely in chronic otitis, is present, when after exploration of the sigmoid fossa an extrasinus abscess or parietal thrombus is found, when no meningitis is present and no other disease of the body, it is not wise to wait for the onset of pyæmic metastases before operating. It is best in a parietal as well as in an obturating primary bulb thrombosis to ligate the jugular before exposing and resecting the bulb.

HARTMANN.

686. UHTHOFF. *On the eye symptoms of thrombosis of the cerebral sinus.*

In otitic sinus phlebitis, choked disk was present in 18%, and optic neuritis in 24% of the cases. Both changes in the optic disk are found more frequently in sinus phlebitis which is complicated with other otitic intracranial suppurations than in uncomplicated cases. These results confirm what the reviewer has pointed out to be the case some time ago.

KÖRNER, ROSTOCK.

687. UCHERMANN. *A case of fatal venous hemorrhage from the ear in a nursling.*

A child aged one year developed an acute swelling on the

left side of the neck, and later a purulent discharge from the ear. After this had persisted for four days there was sudden hemorrhage from the ear. The child was brought to the hospital and hemorrhage recurred. Partial resection of the mastoid process proved this to be healthy. The posterior auditory canal wall was resected. It was then found that the hemorrhage originated from the anterior canal wall directly at the drum. Subsequently there was pyæmia with pleuro-empyæmia. Fourteen days later death, following renewed severe hemorrhage. At autopsy an opening was found at the junction between the anterior and posterior auditory canal wall directly beyond the drum, which led into an abscess cavity, which through a small opening communicated with the internal jugular vein. JÖRGEN MÖLLER.

688. HOFER. *Case of otitic sinus thrombosis in acute purulent otitis.*

In a soldier twenty-two years of age, after an acute right-sided purulent otitis, in the second week there were symptoms of sinus thrombosis. At operation there were found in the antrum and in the cells pus and a few granulations; small extradural abscess. At this place the thrombus, which extended from the torcular to the bulb, was somewhat softened. The thrombus was removed and the sinus loosely packed. Streptococci were found in the pus. At the time of the operation the middle-ear process had ceased. WANNER.

689. TOD, HUNTER. *Lateral sinus thrombosis; subsequent meningitis (meningitis serosa); recovery.*

In performing the complete mastoid operation, the outer wall of the lateral sinus was found to be already exposed within the cavity. Symptoms of thrombosis occurred a few days later. The wound was reopened and the sinus obliterated above and below the affected area. Ten days later facial paralysis occurred on the opposite side with paresis of both external recti muscles, and optic neuritis on the affected side. This was accompanied by drowsiness, headaches, and marked emaciation. Gradual improvement took place with recovery from the facial paralysis; the optic neuritis subsided on the affected side but on the opposite

side optic atrophy occurred and still persists, with almost complete blindness. Otherwise the patient is well, with complete healing of the mastoid wound. HUNTER TOD.

e.—OTHER MIDDLE-EAR DISEASES.

690. YEARSLEY, MACLEOD. Subacute and chronic middle-ear deafness. *The Practitioner*, 1908, lxxx., p. 115.

691. TOD, HUNTER. Primary epithelioma of the tympanic cavity with secondary infection of the skin over the mastoid region. *Proceedings of the Royal Society of Medicine, Otol. Section*, vol. i., No. 3, 1908, p. 15.

692. SUGAR. On the internal treatment of chronic middle-ear catarrh. *Wiener klin. therapeutische Wochenschr.*, Nos. 37, 38, 1907.

693. MADER. Menthol vapor apparatus for the treatment of catarrh of the Eustachian tubes. *Münch. med. Wochenschr.*, 1907, No. 37.

694. ZYTOWITSCH. On the treatment of otitic sclerosis with the faradic current. *Russkij Wratsch.*, Nos. 6, 8, and 11, 1907.

695. PIFFL. Foreign body in the right Eustachian tube; abscess at the base of the skull; suppurative involvement of the atlanto-occipital articulation; aneurysm of the left vertebral artery; death from rupture of this vessel. *Arch. f. Ohrenhkl.*, vol. lxxii., pp. 77-93.

690. YEARSLEY, MACLEOD. *Subacute and chronic middle-ear deafness.*

Causes and treatment are reviewed. Yearsley condemns the use of the Politzer bag as being a dirty and unscientific method and habitually uses the Eustachian catheter for all inflations. Strychnine is recommended as a valuable internal remedy in the later stages of catarrhal inflammation; special emphasis is made of the point that it should be given in large doses, being best administered in the form of tabloids of a thirtieth of a grain three times daily and increasing the dose by one tabloid per diem until the limit of tolerance is reached.

Of the numerous operations suggested for chronic middle-ear catarrh, Yearsley considers mobilization of the fixed malleus as the most valuable and successful.

HUNTER TOD.

691. TOD, HUNTER. *Primary epithelioma of the tympanic cavity with secondary infection of the skin over the mastoid region.*

There was a history of otorrhœa for six months. Owing

to the repeated occurrence of granulations, ossiculectomy was performed and eventually the complete mastoid operation. Further occurrence of exuberant granulations suggested malignancy, which was confirmed on microscopic examination. At subsequent operations more bone was removed, the branches of the external carotid ligatured, and the lymphatic glands in the anterior and posterior triangle of the neck were excised. Complete healing took place within the tympanic cavity. The posterior mastoid wound at first also healed, but afterwards localized thickening occurred at its lower margin, subsequently giving rise to the formation of a typical epitheliomatous ulcer which did not seem to be connected with the underlying bone. The interesting point is the secondary infection of the skin in spite of apparent cure within the mastoid process.

HUNTER TOD.

692. SUGAR. *On the internal treatment of chronic middle-ear catarrh.*

The author advises thiosinamine and various other medicines which are given internally in the treatment of middle-ear catarrh, for the relief of tinnitus.

WANNER.

693. MADER. *Menthol vapor apparatus for the treatment of catarrh of the Eustachian tubes.*

The apparatus consists of a glass flask and spirit lamp in which menthol and oleum pumilionis are warmed. The developing menthol vapor is then forced into the middle ear by means of a catheter and bulb. It seems that the author does not know of the menthol capsule, which needs only to be crushed and used with a rubber bulb apparatus.

HARTMANN.

694. ZYTOWITSCH. *On the treatment of otitic sclerosis with the faradic current.*

On the basis of a number of observations the author comes to the following conclusions: 1. In all patients suffering from otosclerosis the function of the tensor tympani was either entirely lost or greatly diminished. In rare cases the function of this muscle is retained, in which event the stapedius is the one involved. 2. Tinnitus disappears on faradization, or becomes much less severe. 3. Hearing is

improved by this method, probably by improving the accommodative ability. 4. In the use of faradization one electrode must be placed in the pharyngeal opening of the Eustachian tube, the head of the electrode being placed in contact with the upper wall; the second electrode had best be placed in the angle between the lower jaw and the mastoid process. 5. The strength of the current varies in different patients—in general it must be as strong as the patient can tolerate. 6. Duration of the sitting—three to five minutes; frequency—not less than three times a week. SACHER.

695. PIFFL. *Foreign body in the right Eustachian tube; abscess at the base of the skull; suppurative involvement of the atlanto-occipital articulation; aneurysm of the left vertebral artery; death from rupture of this vessel.*

This paper is characterized by the remarkable nature of the case, one which for its rarity, course, and severity of its complications cannot be paralleled in otitic literature. Moreover, the description is unusually interesting, and together with the review of the literature, the clinical observations, and anatomical investigations it furnishes a clear and comprehensive picture of this complicated case. The reviewer thinks that all will read and study this extensive paper with great pleasure.

ZARNIKO.

NERVOUS APPARATUS.

696. MAYER. *Diseases of the ear in progressive general paralysis.* *Arch. f. Ohrenhkl.*, vol. lxxii., pp. 94-122.

697. KUSTNER. *On tumors of the auditory nerve and their diagnosis.* *Arch. f. Ohrenhkl.*, vol. lxxii., pp. 1-10.

698. URBANTSCHITSCH. *Disturbances of speech and writing, paresis of the upper and lower extremities originating in sensory nerves in the middle ear.* *Monatsschr. f. Ohrenhkl.*, 1907, p. 365.

696. MAYER. *Diseases of the ear in progressive general paralysis.*

At Habermann's clinic the author examined histologically nine temporal bones and two brains from five paralytics. It was found: 1. That there are in progressive paralysis degenerative changes in the auditory nerve (of the nerve, ganglion or branches) which are intermediary and of a tabetic nature. 2. In addition to this tabetic atrophy there is probably

also a marantic degenerative neuritis of the auditory nerve.

3. In many cases there is a marked chronic inflammation of the meninges, usually of a hemorrhagic character. 4. In the nerves themselves there are interstitial inflammatory processes. 5. Degenerations are found in the circulatory apparatus of the internal ear depending upon sclerotic changes in the blood-vessels, causing secondarily an atrophy of Corti's organ. In order to obtain some clinical observations on disturbances of hearing in paralytics, ten patients of the Insane Asylum of Feldhof were examined by the author. He reaches the following conclusions: 1. The symptoms of disturbed auditory function in the beginning stages of paralysis depend generally upon peripheral changes in the auditory apparatus, although central causes cannot be excluded. 2. Deafness in progressive paralysis is in most cases due to a degeneration of the cochlea which is generally of a tabetic nature. Sclerotic and senile changes are observed in the later stages, but are not prominent in the clinical symptom picture. ZARNIKO.

697. KUSTNER. *On tumors of the auditory nerve and their diagnosis.*

The auditory nerve has been the seat of fibroma, sarcoma, gummata, neuroma, and glioma, but generally of mixed tumors, as gliofibroma, neuroglioma, or fibrosarcoma. The new formation rarely occurs in the auditory tract itself, but the base of the skull (cerebellar auditory recess), and thus injures the nerve by compression. It is remarkable that the auditory nerve has been found affected three times as often as the adjacent facial nerve. For the diagnosis there are:

1. Prodromal symptoms: slow but steady diminution of hearing with the absence of any demonstrable ear disease; head pressure; vertigo; weakness in the extremities. 2. General symptoms: symptoms of brain pressure, choked disk, vomiting, sometimes lesion of the optic nerve leading to atrophy, dulness, severe pain in the cerebellar region. 3. Head symptoms: lesions of the auditory nerve: (a) vomiting, frequently presenting a typical picture of Ménière's disease; (b) hearing disturbances up to complete nerve deafness. 4. Symptoms of immediately surrounding structures: (a) Disturbances of innervation of the extremities, of a motor

and sensory character; (b) disturbances in the region of the auditory nerve; paresis of the eye muscles, nystagmus, paresis of the abducens, oculomotor, trigeminus and facial nerves; more rarely changes in the glossopharyngeal, vagus, accessory, and hypoglossal. According to the author, therefore, there is a well characterized picture present in those cases where before complete nervous deafness there are various disturbances of the nerves in the posterior cerebellar region. There are no means of accurately differentiating between tumors of the auditory nerve and those occurring in the cerebellar region.

ZARNIKO.

698. URBANTSCHITSCH. *Disturbances of speech and writing, paresis of the upper and lower extremities originating in sensory nerves in the middle ear.*

The author reports on further cases of paralysis of the lower extremities in the course of ear disease. Two cases are of paralysis of the left upper and lower extremities, which in one case was brought about by a left-sided and in the other by a right-sided middle-ear suppuration; in a third case there was paralysis of both lower extremities produced by a bilateral otitis. In the former case the middle-ear disease produced stuttering and pain in the left shoulder, and in the third, burning in the heels. Further, the author gives the case history of a woman fifty-one years of age with aphasic disturbances (sensory aphasia and agraphia) which were improved and finally cured after treatment of a simultaneous, right-sided suppuration of the antrum of Highmore. Finally, various writing specimens are given of a case where a tampon in the right tympanum caused a slight disturbance in writing, while packing in the right side of the nose caused a marked disturbance.

WITTMACK.

NOSE AND NASO-PHARYNX.

a.—GENERAL PATHOLOGY AND TREATMENT.

699. ZIEM. *On the importance of nasal affections in the treatment of scrofulous diseases.* *Monatsschr. f. Ohrenhkl.*, 1907, No. 6, p. 312.

700. WOLF. *Case of atrophy of the optic nerves with spontaneous discharge of cerebro-spinal fluid from the nose.* *Inaugural Dissertation*, Rostock, 1907.

701. GOLDSCHMIDT. On the question of nasal packing. *Monatsschr. f. Ohrenhkk.*, 1907, Pt. 3, p. 273.

702. GRÜNBERG. On the treatment of tuberculosis of the nose, pharynx, and larynx with iodine and mercury. *Münch. med. Wochenschr.*, 1907, No. 34.

703. WEDERHAKKE. On paraffine prosthesis. *Deutsche med. Wochenschr.*, No. 40, 1907.

704. SCHLOSSER. Further report on a case of tumor of the hypophysis which had been operated upon. (Sudden death 2½ months after operation.) *Wiener klin. Wochenschr.*, No. 26, 1907.

705. EISELSBERG and FRANKL-HOCHWART. On the operative treatment of tumors of the hypophysis. *Wiener med. Wochenschr.*, No. 39, 1907.

706. RICHTER, G. Art of gargling. *Med. Record*, Dec. 14, 1907.

707. STIMSON, A. B. Primary nasal diphtheria, with report of several cases, one an infant ten days old. *N. Y. Med. Jour.*, Dec. 14, 1907.

708. JOHNSTON, RICHARD H. Obstruction in the nose or in the throat as cause of nervous and mental diseases in school life. *N. Y. Med. Jour.*, Nov. 30, 1907.

709. BRYANT, W. SOHIER. The nose in its relation to epilepsy. *Med. Record*, Nov. 23, 1907.

710. SEIBERT, A. Prophylaxis in epidemic cerebro-spinal meningitis. *Jour. Am. Med. Assn.*, Nov. 20, 1907.

711. HOLMES, B. Influence of trauma in localizing infection in the natural mucous cavities of the body. *Lancet-Clinic*, Nov. 2, 1907.

712. INGALS, E. FLETCHER. The relation of tonsillitis and rheumatism. *Laryngoscope*, Sept., 1907.

713. KERLEY, C. G. Questionable influence of the so-called dietetic condition in diseases of the throat and nose in children. *N. Y. Med. Jour.*, August 24, 1907.

714. HABERMAAS, A. The treatment of diphtheria with refined and concentrated antitoxin. *St. Louis Med. Review*, August, 1907.

715. HURD, L. M. Differential diagnosis of tuberculosis and syphilis of the upper respiratory tract. *Laryngoscope*, July, 1907.

716. SOLIS-COHEN, M. Latent diphtheria. A public-health problem. *Jour. Am. Med. Assn.*, July 6, 1907.

699. ZIEM. On the importance of nasal affections in the treatment of scrofulous diseases.

The author draws attention to the importance of certain nasal diseases in the treatment of so-called scrofulous eye diseases, which in the opinion of the author are not always due to tuberculosis but may result from malaria, influenza, measles, scarlet fever, and other infectious diseases. In addition to the local treatment of the eyes, general treatment,

and especially the presence of fever, should be given attention. The special therapeutic measures must be read in the original.

WITTMACK.

700. WOLF. *Case of atrophy of the optic nerves with spontaneous discharge of the cerebro-spinal fluid from the nose.*

After the report of a case observed in the Rostock eye clinic the author has collected similar cases from the literature. Of the eighteen collected cases five were examined post-mortem. It seems that in these eighteen cases the simultaneous appearance of spontaneous discharge of cerebro-spinal fluid and optic-nerve atrophy does not represent an etiologically similar morbid process, but is to be regarded only as a symptom complex which may occur in various cases of cerebral disease differently localized, and dominate the clinical picture.

ROPKE.

701. GOLDSCHMIDT. *On the question of nasal packing.*

In place of packing in mild cases the author recommends the use of mixed renoform and boric acid powder in the nose, which the patient is to use every fifteen to twenty minutes after the operation for some hours. When packing is necessary it is best to use gauze soaked in renoform solution.

WITTMACK.

702. GRÜNBERG. *On the treatment of tuberculosis of the nose, pharynx, and larynx with iodine and mercury.*

In this case where tuberculosis was proven by microscope and animal inoculation, recovery took place after four and one half months of treatment with iodide of potash and especially mercury. As others have reported similar favorable results in tuberculosis, the author warns against concluding that syphilis is present owing to the favorable influence of this form of treatment. The reviewer has observed a case of lupus which also healed under the use of iodide of potash and locally calomel, while the nodules in the skin did not disappear until after Finsen treatment.

SCHEIBE.

703. WEDERHAKE. *On paraffine prosthesis.*

To diminish the possibility of embolism the author uses

a mixture composed of 1gr. of pure rubber and 13gr. of hard paraffine with a melting point of 58° which are heated in a porcelain dish and triturated until the rubber is dissolved. If bone is to be replaced, 1gr. of precipitated calcium carbonate is added and this mixture must be injected in a warm if not a hot condition. NOLTENIUS.

704. SCHLOSSER. *Further report on a case of tumor of the hypophysis which had been operated upon (sudden death two and one half months after operation).*

The autopsy showed that the size of the tumor had been underestimated and a large part of it remained which extended into the basal part of the frontal lobes. The operative wound at the base of the skull was found to be healed by firm scar tissue. Eight days before death there were headache, nausea, vomiting, and constipation. The improvement which existed until shortly before death the author believes to have been due to the relief of pressure. WANNER.

705. EISELSBERG and FRANKL-HOCHWART. *On the operative treatment of tumors of the hypophysis.*

A patient twenty years of age suffered in his twelfth year from paroxysms of headache and vomiting. At the age of fourteen, vision in the left eye diminished, and there were hemianopsia and marked development of adipose tissue. These disturbances disappeared upon treatment with thyroid gland. In 1907 there was a return of the hemianopsia, also right-sided atrophy of the temporal half of the papilla; genuine atrophy of the left; scanty development of the hair on the body. Radiographs revealed the destruction of the pituitary body, sella turcica, and posterior clinoid process. Operation: After displacing the nose to the right, division of the septum, removal of superior turbinates, exposure of the frontal sinus. The anterior wall of the frontal sinus was opened and removed; resection of the vomer to its origin; detachment of the perosteum to the anterior wall of the pituitary cavity. This cavity was opened and in the depths a white membrane appeared. Incision in the middle line was followed by the escape of several tablespoonfuls of bloody fluid which had filled a tumor cavity. This proved to be a cyst occupying

the position of the hypophysis. After removal of the walls the cavity was packed with iodoform gauze. Examination of the walls of the sac suggested carcinoma. The wound was healed in twelve days. The headache practically disappeared and vision improved.

WANNER.

706. RICHTER, G. *Art of gargling.*

The author proposes the following method: The head should be bent as far backward as possible with the tongue protruded. In this position an attempt is made to swallow the gargling fluid which causes it to well upwards into the naso-pharynx and nostrils, then by suddenly throwing the head forward the fluid runs out of the nostrils, thoroughly cleansing the passages.

CLEMENS.

707. STIMSON, A. B. *Primary nasal diphtheria, with report of several cases, one an infant ten days old.*

Five cases are reported by the author who calls attention to the following points: The disease is more common than is usually supposed; it is usually benign, the primary form seldom malignant in itself, and especially is this so if the disease remains confined to the nares; it tends to limit itself to the nose, but increases in gravity pari passu with extension; it tends towards chronicity, is of good prognosis, and paralytic phenomena are extremely rare; it acts as a focus of infection, however, and the resulting cases may be of a malignant type.

CLEMENS.

708. JOHNSTON, RICHARD H. *Obstruction in the nose or in the throat as cause of nervous and mental diseases in school life.*

The real nature of mental and nervous troubles in these cases is looked upon to be toxic due to a deficiency of oxygen in the inspired air. Among the symptoms mentioned are: mental dulness, restlessness, night terrors, nocturnal incontinence, headaches, defects of speech, choreic movements of the face, reflex nervous cough, and irritability.

CLEMENS.

709. BRYANT, W. SOHIER. *The nose in its relation to epilepsy.*

In the rhinologic examination of forty-eight cases of epileptic

insanity all were found to have extensive abnormalities of the nares and many had suppuration and sinusitis. Although the work has not as yet been completed there is noticed a slight decrease in the number of epileptic seizures and slight increase in the general mental and physical condition. The author believes that epilepsy is a normal symptom consequent on over-stimulation (largely reflex in character) of the higher centres of the cord and brain. The most common cause of epileptic seizures is reflexes from Schneiderian irritation through the fifth nerve.

CLEMENS.

710. SEIBERT, A. *Prophylaxis in epidemic cerebro-spinal meningitis.*

The prophylactic means employed is to destroy the meningococcus in the naso-pharyngeal mucus and mucosa. The author uses equal parts of resorcin and alcohol. The alcohol must be heated before the resorcin is added. Two applications on cotton, one past each side of the uvula, reaching to the ceiling of the naso-pharynx, are sufficient. Six treatments usually suffice to stop all secretions of postnasal mucus. Infants one month old bear the treatment equally as well as adults.

This treatment has also been used with good results in destroying the streptococci in scarlatinous pharyngitis. The frequency of the applications depend on the advanced condition of the case. The pharynx has been disinfected after attacks of pneumonia, diphtheria, tonsillitis, influenza, and measles to prevent early recurrence and transmission to others.

CLEMENS.

711. HOLMES, B. *Influence of trauma in localizing infection in the natural mucous cavities of the body.*

It is thought that some long-forgotten traumatism is responsible for infection in the mucous cavities causing obstruction. Fractures of the base of the skull and injuries to the temporal bone following mastoid infection or trouble in the cranial sinuses are mentioned.

CLEMENS.

712. INGALS, E. FLETCHER. *The relation of tonsillitis and rheumatism.*

From an analysis of the cases examined and studied, the

author draws the following conclusions: 45% of the cases of tonsillitis have a rheumatic history, but 16% of other affections of the throat and chest also have a rheumatic history so that not more than 29% of the cases of acute tonsillitis can be fairly attributed in any way to the rheumatic poison, and more than one half of these are doubtful. In 8% the cases were attended by or immediately followed by articular rheumatism; the same number claimed to have had muscular rheumatism, and in 5% the attack immediately preceded the angina. It is not proved that the tonsil is the only or chief portal for the entrance of rheumatic poison. There is no evidence to justify the belief that inflammation of the tonsil may prevent, or take the place of, an attack of rheumatism.

CLEMENS.

713. KERLEY, C. G. *Questionable influence of the so-called dietetic condition in diseases of the throat and nose in children.*

The author does not find that any special type of constitution markedly tends towards the development of adenoids or enlarged tonsils. He thinks the habit of sucking the thumb in early childhood favors the production of hyperæmia and stasis, and the friction of the soft palate against the posterior wall gives rise to irritation, congestion, and hypertrophy of the mucous glands. Colds are a common factor, and the excessive eating of cane-sugar has been noted a common element in their production. Cane-sugar may be toxic if given to any child in sufficiently large amounts.

CLEMENS.

714. HABERMAAS, A. *The treatment of diphtheria with refined and concentrated antitoxin.*

It is shown that the really deleterious effects of the serum are in most instances overlooked and the usual sequelæ of diphtheria itself are wrongly attributed to the use of antitoxin. Most of the unpleasant manifestations following the use of antitoxin serum are largely due to the irritating effects of the horse serum. The author summarizes the results of treatment with the concentrated and refined serum in seventy-five cases. Its antitoxic value is unimpaired and the small

bulk presents more rapid and less painful injection with less local irritation. CLEMENS.

715. HURD, L. M. *Differential diagnosis of tuberculosis and syphilis of the upper respiratory tract.*

The conclusion drawn from the character of the microscopical findings in two doubtful cases here reported in detail is, that certain phases of syphilitic inflammation of the mucosa are histologically identical with those seen in tuberculosis. Giant cells not differing apparently from those seen in tuberculosis may be easily demonstrated. The presumptive diagnosis, whatever the clinical history, should be syphilis when the marked vascular thickening and a number of giant-cells are out of all proportion to, and more prominent than, the coagulation necrosis, unless tubercle bacilli can be demonstrated in the tissues. CLEMENS.

716. SOLIS-COHEN, M. *Latent diphtheria. A public-health problem.*

This paper criticises modern methods in handling diphtheria infection. The simple disinfection of harmless fomites as practised creates a false sense of security and little or no attention is paid to the virulent bacilli often carried about by those who have been in contact with the patients, or by the convalescents themselves. Latent cases are responsible for outbreaks and epidemics of diphtheria; they are just as contagious as the acute membranous type and should be included in the notifiable diseases. It is suggested that two negative cultures should be obtained before any patient in whose throat virulent bacilli have been found should be allowed to be at large. CLEMENS.

b.—OZÆNA.

717. PEREZ. *Ozæna. Revista de la sociedad medica argentina*, 1907.

717. PEREZ. *Ozæna.*

The purpose of this paper is to prove that ozæna is a contagious disease and that the diseases of the nasal sinuses, to which Grünwald has drawn attention, are to be regarded as ozæna. Perez has collected 98 cases in which infection took

place through members of the same family, 36 cases of infection from outside of the family, 16 cases of infection from dogs, and 36 cases with unknown infection. Ozæna is a disease of childhood, and the author's statistics have also shown that it occurs more frequently in females. The ozæna bacillus is gram-negative; it does not fluidify gelatine, does not coagulate milk, and produces indol. It is pathogenic for guinea-pigs, mice, rabbits, and doves. The cultures develop the characteristic fetor of ozæna. Intravenous injections cause disease of the nasal mucosa with the well-known discharge in which the bacilli are found, as well as atrophy of the lower turbinates. Although Grünwald declares that the atrophy is due to the pressure of the scabs, the other symptoms cannot be explained on this basis. According to the author ozæna is a contagious rhino-sinusitis.

BRANDT.

C.—NASAL TUMORS.

718. WRIGHT, J. Nasal sporozoon (*rhinosporidium kinealyi*). *N. Y. Med. Jour.*, Dec. 21, 1907.

719. BECO. Nasal polypi in children. *La presse oto-laryngologique*, 1907, Pt. 10.

720. WOLF. Histology of benign nasal tumors. *Monatsschr. f. Ohrenheilk.*, 1907, Pt. 8, pp. 429.

721. MÖLLER. Bleeding nasal polypi. *Arch. f. Laryngol.*, vol. xx., Pt. 1.

722. UFFENORDE. Chondroma of the nasal cavity. *Arch. f. Laryngol.*, vol. xx., Pt. 2.

723. MATHIEU. On tumors of the nasal fossæ. *Thèse de Paris*, 1906.

724. DELIE. Lymphosarcoma of the middle turbinate. *Arch. internat. d'otol.*, etc., No. 6, 1907.

725. DELIE. Carcinoma of the inferior turbinate. *Arch. internat. d'otol.*, etc., No. 5, 1907, p. 547.

718. WRIGHT, J. Nasal sporozoon (*rhinosporidium kinealyi*).

The report of a papillomatous growth removed from the nasal passages leads the observer to pronounce the above diagnosis. The growth occurred in a farmer who had never been away from the neighborhood of Memphis, Tenn. In all cases observed, the organism has occurred in granulation

tissue near the vestibule of the nose, which suggests the conveyance of infection by the finger nails. Very minute white dots stud the tissue and are seen with a low power to be small spheroid cysts embedded in granulation tissue. The structure of the cysts is described in detail, with illustrations, which are regarded as protozoan organisms. There was no evidence of metastasis in any of the cases. CLEMENS.

719. BECO. *Nasal polypi in children.*

Cases of nasal polyp in children are not very frequent. In 30,000 patients there were only 4 cases in children under fourteen years of age; one was a nasal polyp, while the other three originated in the choanæ. BRANDT.

720. WOLF. *Histology of benign nasal tumors.*

Clinical and histological data of a hard fibroma of the nasal introitus, 2 cases of angiofibroma of the nasal floor and anterior extremity of the lower turbinate, one case of papilloma of the septum, and finally a case of polyp of the margin of the choanæ. WITTMACK.

721. MOLLER. *Bleeding nasal polypi.*

Review of the literature and report of 2 new cases. Both were in women and show a relation to lactation and gestation. VON EICKEN.

722. UFFENORDE. *Chondroma of the nasal cavity.*

Report of a case which is interesting because on posterior rhinoscopy a prominence was found on the posterior ethmoid on the right side. Various methods of operating on the sinuses of the nose are described. In order to reach the frontal, ethmoid, and maxillary sinuses a modification of the Mischau-Legouest-Mouresche method is given, in which the line of incision is analogous to Killian's method, except that it extends lower down along the side of the nose in order to include the maxillary sinus. VON EICKEN.

723. MATHIEU. *On tumors of the nasal fossæ.*

Chondromata of the nasal cavity and sinuses are unusual. Only 21 cases have been reported in literature, of which 15 were under twenty-five years of age and only 3 over fifty.

The male sex predominated. The tumors varied in size from a hazel-nut to a fist. They were usually of hyaline cartilage. In 8 cases they originated in the cartilaginous septum, 5 from the superior maxillary, 5 from the ethmoid, one from the nasal walls, and one from the occipital bone. The symptoms depend upon the size of the tumor. In only 3 cases was there rapid growth. In 5 cases the tumor recurred. OPPIKOFEK.

724. DELIE. *Lymphosarcoma of the middle turbinate.*

The sarcoma was limited to the left middle turbinate. The patient was thirty-eight years of age. Recurrence six months after operation. OPPIKOFEK.

725. DELIE. *Carcinoma of the inferior turbinate.*

A girl, fifteen years of age, presented a carcinoma which started from the posterior half of the right lower turbinate and included the canine fossa. It was removed with resection of the inner wall of the maxillary sinus. No recurrence two years after operation. The diagnosis was confirmed by the microscope. OPPIKOFEK.

d.—DISEASES OF THE NASAL SINUSES.

726. DEAN, W. L. Relation of nasal accessory-sinus trouble with asthma. *Iowa Med. Jour.*, December, 1907.

727. COFFIN, L. A. Intracranial complications of disease of the accessory sinuses of the nose. *Med. Record*, November 9, 1907.

728. GOOD, R. H. A simple and safe operation on the frontal sinuses by the intranasal route. *Jour. Am. Med. Assn.*, August 31, 1907.

729. GOLDMANN and KILLIAN. On the use of the X-rays to determine the extent and diseases of the nasal sinuses. *Beitrag z. klin. Chirurgie*, vol. liv., Pt. 1.

730. ALBRECHT. Importance of X-rays for the diagnosis of accessory-sinus disease. *Arch. internat. d'otol.*, etc., vol. xx., Pt. 2.

731. VOHSSEN. On the value of diaphanoscopy in diseases of the frontal sinus. *Arch. internat. d'otol.*, etc., vol. xxiv., p. 426.

732. OPPIKOFEK. On the formation of stone in the maxillary cavity. *Arch. f. Laryngol.*, vol. xx., Pt. 1.

733. ANDEREYA. Diagnosis and treatment of cyst of the superior maxillary. *Arch. f. Laryngol.*, vol. xx., Pt. 2.

734. ONODI. Instruments for the endonasal opening of maxillary sinus and ethmoid cells. *Arch. f. Laryngol.*, vol. xx., Pt. 2.

735. FREY. On the treatment of chronic empyema of the maxillary sinus. *Munch. med. Wochenschr.*, 1907, No. 45.

736. RICHOU. On the study of cancer of the maxillary antrum. *Thèse de Paris*.

737. LUBLINSKI. When is radical operation on the nasal accessory cavities necessary? *Deutsche med. Wochenschr.*, No. 49, 1907.

738. HAJEK. On indications for the radical operation of inflammatory diseases of the nasal accessory sinuses. *Wiener klin. Rundschau*, Nos. 26, 27, 1907.

739. WEIL. Remarks on the use of the suction treatment in nasal suppuration. *Wiener med. Wochenschr.*, Nos. 26, 27, 28, 1907.

740. SICARD. Endocranial complications of frontal-sinus disease. *Thèse de Toulouse*.

741. MAYER. On disturbances of vision and blindness of nasal origin. *Wiener klin. Wochenschr.*, No. 30, 1907.

726. DEAN, W. L. *Relation of nasal accessory-sinus trouble with asthma.*

The writer reports three cases in which the medical and surgical treatment for accessory-sinus disease appeared to relieve the asthmatic trouble almost to a degree of extinction.

CLEMENS.

727. COFFIN, L. A. *Intracranial complications of disease of the accessory sinuses of the nose.*

Cerebral complications are most frequent in disease of the sphenoidal sinus, and least so in that of the ethmoidal of which the writer has never known an instance. CLEMENS.

728. GOOD, R. H. *A simple and safe operation on the frontal sinuses by the intranasal route.*

The instruments used in this operation are: two frontal sinus rasps, two tapering curved chisels, and three brass protectors capable of being bent into various shapes on the flat only. These protectors are used when the author operates with chisels; they are tapering and blunt on the edge so that if the sharp edge of the chisel should strike a bony surface it will glide off instead of penetrating. The rasps are made slightly curved to fit the frontal sinus and with the teeth on the longitudinally concave surface pointing towards the handle. The different steps of the operation are fully described.

CLEMENS.

729. GOLDMANN and KILLIAN. *On the use of the X-rays to determine the extent and diseases of the nasal sinuses.*

The pictures were usually taken in sagittal diameter. The patient was placed with his forehead on the photographic plate, and the diaphragm was so arranged that the occipital protuberance appeared in the centre of its aperture. The authors conclude that the X-ray is an important diagnostic method especially in the sagittal diameter of the skull which can give us information on the topographic anatomic relation of the accessory sinuses and their diseases. It ranks as one of the most important methods of examination, but cannot in itself take the place of the other methods. Excellent reproductions of the Röntgen photographs are given.

HARTMANN.

730. ALBRECHT. *Importance of X-rays for the diagnosis of accessory-sinus disease.*

The author has observed on patients and cadavers the value of the X-ray pictures taken in the antero-posterior diameter in diseases of the accessory sinuses, and concludes that in suppuration of the maxillary sinuses the method is not of great value, but serves a better purpose in tumors of the superior maxillary. This method is of great importance in suppurations of the frontal sinus, although one cannot rely entirely upon the X-ray picture. The radiographs of the ethmoid cells are very important, and show from a slight cloudiness to a marked shadow according as one or more of the cells are affected. According to the author, a diseased mucous membrane may cause a cloudiness of the Röntgen picture, as well as pus itself.

VON EICKEN.

731. VONSEN. *On the value of diaphanoscopy in diseases of the frontal sinus.*

The author discusses the value of transillumination in disease of the frontal sinus and compares diaphanoscopy with the results given by radiographs. He comes to the conclusion that in general radiographs do not accomplish more than diaphanoscopy.

OPPIKOFER.

732. OPPIKOFER. *On the formation of stone in the maxillary cavity.*

In a patient sixty years of age with chronic suppuration

of the right maxillary sinus, the antrum was operated upon according to the Caldwell-Luc method, and a concretion about the size of a hazel-nut with a rough surface was found and subjected to careful chemical analysis. Of further interest in the case was the fact that on histological examination the mucous membrane was found to have undergone carcinomatous degeneration. Normal conditions were found to be present on examination three years afterward.

VON EICKEN.

733. ANDEREYA. *Diagnosis and treatment of cyst of the superior maxillary.*

Report of six cases. In the treatment of cyst it is necessary only to remove part of the cyst wall and establish a free communication with the mouth. If this is done healing will soon follow.

VON EICKEN.

734. ONODI. *Instruments for the endonasal opening of maxillary sinus and ethmoid cells.*

The first instrument is a combination of trocar and die. It is possible with this to open up the maxillary antrum endonasally either in the lower or middle portion. The second instrument consists of a strong sharp forceps with which the ethmoid cells can be easily opened.

VON EICKEN.

735. FREY. *On the treatment of chronic empyema of the maxillary sinus.*

Frey reports twenty-one patients operated upon by the Kretschmann-Denker method. Seventeen are already cured and in the other four healing is expected. The entire after-treatment occupies sixteen and one-half days. SCHEIBE.

736. RICHOU. *On the study of cancer of the maxillary antrum.*

On the basis of seventeen cases of which only thirteen were examined histologically (eight sarcoma and five carcinoma) the author gives the etiology, pathological anatomy, course, diagnosis, and treatment of malignant tumors of the superior maxillary. The case-histories are fully discussed, and finally the work of other French authors in the literature is reviewed.

OPPIKOFER.

737. LUBLINSKI. *When is radical operation on the nasal cavities necessary?*

The author is of the opinion that in acute disease of the nasal accessory sinuses radical operation is scarcely ever indicated; inflammation of the antrum of Highmore especially rarely calls for operative interference, except at most a puncture from the nose with a few irrigations; in inflammation of the frontal sinus the removal of the anterior extremity of the middle turbinate will generally bring about the desired result. In chronic disease of the superior maxillary sinus, if a diseased tooth is the cause, treatment can be undertaken by way of the alveolus when the tooth has been removed. In the balance of the cases, opening and irrigation by way of the inferior meatus will usually be followed by healing. The radical operation is only indicated in cases with carious bone and in old neglected cases, but a lasting result cannot always be guaranteed. In chronic frontal-sinus suppuration the author considers the radical operation only indicated when the process has extended to the orbit or brain. The ethmoid and sphenoid sinuses are rarely involved alone; therefore, the same indications hold for these cavities as for the frontal sinus.

NOLTENIUS.

738. HAJEK. *On indications for the radical operation of inflammatory diseases of the nasal accessory sinuses.*

The question whether it is absolutely necessary to resort to radical operation in a suppuration of the maxillary cavity is answered by the author by stating that the radical operation is indicated only in exceptional cases where there is complicating bone disease, or where the cavity is filled with polypi and cysts. The indications may also be physical or social. Ninety to ninety-five per cent. of the cases of acute frontal-sinus affection heal under treatment with aspirin and rest in bed. In acute cases of suppuration in which retention symptoms are present, the author recommends resection of the anterior end of the middle turbinate, as well as in the large majority of cases of chronic empyema of the frontal sinus which have lasted for years and in which no irreparable changes have taken place in the mucous membrane or in the bone. Ninety per cent. of the cases of chronic

frontal-sinus suppuration will yield to this treatment. Of the remaining 10% there may be persistence of the discharge, intense headache, and tenderness of the sinus wall in 5%, and in such cases it will be necessary to operate. In the other 5% in which there is merely hypersecretion, it is wise to wait after resection of the turbinate, the author having in some cases waited as long as a year.

The indications for radical operation according to the author are: 1. When the external examination shows that the bone structure is affected. 2. When there is a suspicion that the process may extend to dura and meninges. In disease of the ethmoid labyrinth it is safe to wait as long as there is discharge of catarrhal secretion; when retention occurs an opening must be made. In suppuration of the sphenoid cavity in old, severe cases, after resection of the middle turbinate the sphenoid is exposed and the opening widened. Of 7000 new cases, about 10 demanded radical operation of the maxillary antrum and 5 or 6 of the frontal sinus. In chronic empyema irrigation through the natural openings should be attempted. Opening through the alveolus should only be practised when a diseased root of a tooth is suspected; in other cases the author advocates opening the maxillary antrum from below with resection of the inferior turbinate. In general the author believes that operation is done much too frequently.

WANNER.

739. WEIL. *Remarks on the use of the suction treatment in nasal suppuration.*

By means of a glass model, aspiration of the frontal sinus, ethmoid cells, maxillary antrum, and nasal cavities is shown. These cavities are filled with a solution of starch colored with iodine. On moderate suction and at first on strong suction there is no change in the solution. On continuous forced suction a little fluid appears at the end of the duct and a small air vesicle rises on cessation of suction; this is repeated in greater degree at every suction. At the same time the fluid in the cavity which represents the superior maxillary is aspirated, and at the end of the experiment half of the fluid aspirated from the frontal sinus is found at the bottom of the maxillary antrum. On further experiments in which the

maxillary antrum alone was tested, aspiration was followed by the same results as long as fluid was present above the level of the opening. After a marked aspiration, about one fifth atmosphere, the fluid from the middle passage is observed to be forced against the top of the frontal sinus. If the level of the fluid in the superior maxillary is below the opening, aspiration has no result; if, however, the opening is lower, fluid can be aspirated. These experiments show that the cavities may be aspirated and emptied. This is easier if the walls are not firm. Of particular interest is the experiment that through aspiration, fluid can be forced into empty cavities. The danger of infecting the ear is a definite one, because on cessation of aspiration any pus situated in the tubal ostium may be forced into the tympanum. This method can be used carefully for diagnostic purposes, but should not be used therapeutically in nasal suppuration, especially in acute cases.

WANNER.

740. SICARD. *Endocranial complications of frontal-sinus disease.*

The author has collected 32 cases from the literature, which, through acute or chronic frontal-sinus suppuration, led to endocranial complications. The symptoms and course are described. In operating on the frontal sinus, forcible curetting should not be practised.

OPPIKOFER.

741. MAYER. *On disturbances of vision and blindness of nasal origin.*

In a patient, seventy-six years of age, who suffered for three or four years from a right-sided empyema of the nasal accessory cavities, sudden blindness of the right eye developed, following an acute congestion of the nasal mucous membrane. During the next three weeks, vision in the left eye was reduced three-tenths. In the middle meatus on the right side there were polypi and pus. On opening the maxillary and sphenoid sinuses, also the posterior ethmoid cells on the right side, vision on the left side improved until it became nearly normal. The author believes the cause of the loss of vision to have been, in disease of the sphenoid sinus and posterior ethmoid cells, through a direct extension of the inflammation along

the connection between the venous system of the nasal accessory sinuses and the ophthalmic plexus of veins. The loss of sight in the right eye was due to extension of the inflammation of the right optic nerve to the left. WANNER.

e.—OTHER DISEASES OF THE NOSE.

742. MACKENTY, JNO. E. Congenital occlusion of the choanæ. *Med. Record*, September 7, 1907.

743. JACKSON, CHEVALIER. Septal perforations; their closure by plastic operation. *Med. Record*, October 12, 1907.

744. WEIGHTMAN, W. A. Massage of the inferior turbinates in the treatment of atrophic rhinitis. *Post-Graduate*, August, 1907.

745. ROSE, FRANK A. Membranous rhinitis. *The practitioner*, 1908, vol. lxxx., p. 135.

746. JOSEPH. The correction of crooked nose. *Deutsche med. Wochenschr.*, No. 49, 1907.

747. DE CIGNA. Premonitory epistaxis. *Arch. internat. d'otol.*, etc., vol. xxiv., p. 105.

748. SIEBENMANN. Involvement of the mucous membrane in general hyperkeratosis of the skin. *Arch. f. Laryng.*, vol. xx., Pt. 1.

749. HÜRLIMAUN. On the treatment of hay fever. *Korrespondenzblatt f. Schweizerärzte*, No. 15, 1907.

750. HEYMANN. On hay fever. *Berl. klin. Wochenschr.*, 1907, No. 13.

742. MACKENTY, JNO. E. Congenital occlusion of the choanæ.

Of the two cases reported, one was complete occlusion and the other unilateral. In one case there was discharge from the right ear and a gradual increasing deafness in both. The operation was practically the same in both cases: after incising the mucous membrane the bone was removed with punch and forceps, going deep into the floor and inner wall but avoiding the outer wall. The results obtained were found four years later to be: perfect breathing, the nasal membranes still atrophic, the hearing increased in the left ear but not in the right. No packing or dilator was used to keep the space open. CLEMENS.

743. JACKSON, CHEVALIER. Septal perforations; their closure by plastic operation.

The operation consists in taking a large round or tongue-shaped flap from the mucosa and submucosa over the inferior

turbinal. It must be at least 6mm larger vertically than the perforation and usually as long as the turbinal itself. The flap is raised and, after freshening the edges of the perforation, is stitched in place. If the perforation is large it is well to duplicate the operation on the other side. The synechia resulting from the union of the flap with the septum is easily removed by clipping out a section of the bridge formed by the flap and inserting a strip of bismuth lint for five days. All the excess of the inferior turbinal must be removed or a troublesome synechia will result. The operation may be used on cicatricial septa and on those where the cartilage has been removed by a submucous operation.

CLEMENS.

744. WEIGHTMAN, W. A. *Massage of the inferior turbinates in the treatment of atrophic rhinitis.*

Four cases are here reported in which massage of the inferior turbinates was resorted to in the treatment of atrophic rhinitis. In addition to local cleanliness, the inferior turbinates were massaged twice a week by a gentle stroking with an applicator covered with a pledget of cotton soaked in Dobell's solution. Considerable improvement was observed at the end of one month. The mucous membrane became more nearly normal in appearance, the dryness disappeared, and the function of smell returned. The administration of potass. iodide in small doses aided materially by increasing the flow of pharyngeal mucus.

CLEMENS.

745. ROSE, FRANK A. *Membranous rhinitis.*

The symptoms and treatment, based on eight cases, are reviewed. Rose strongly upholds the view that the bacillus of membranous rhinitis and that of diphtheria are identical.

HUNTER TOD.

746. JOSEPH. *The correction of crooked nose.*

Joseph reports on 23 cases of nasal deformity which he has operated and cured. The deformity was partly cartilaginous and partly bony. Illustrations before and after operation show the excellent results obtained. Only three cases were operated under general narcosis; in all the others local anæsthesia was employed—eusemin, a combination of cocain

and adrenalin. The cartilaginous deformity was corrected by boring a hole in the bone close to the edge of the pyriform incisure, then passing a strong silk thread through this opening; the silk thread was also passed through the cartilaginous septum, which was then drawn close to the opening in the bone and fixed in this position for several weeks until the normal position of the septum was assured. In the correction of bony deformities a small triangular piece of bone is resected from the nasal process of the left superior maxilla if the nose is turned toward the right; on the other side, linear separation of the bone. An apparatus must be worn on the operated nose until healing is complete. This treatment is carried out intranasally and subcutaneously. NOLTENIUS.

747. DE CIGNA. *Premonitory epistaxis.*

The author gives the case-histories of twenty-three aged individuals in whom epistaxis preceded cerebral hemorrhage. In arteriosclerosis epistaxis must be regarded as an urgent symptom pointing to the need of treatment. OPPIKOFEK.

748. SIEBENMANN. *Involvement of the mucous membrane in general hyperkeratosis of the skin.*

Report of a case of ichthyosis hyperkeratosis in which the mucous membrane was also involved; also complete report of a case of ichthyosiform disease. VON EICKEN.

749. HÜRLIMAUN. *On the treatment of hay fever.*

Two stubborn cases of hay fever were speedily cured on inhaling dry hot air. A receptacle containing six electric red lights was tilted over the patient's face; free air was admitted on the sides. OPPIKOFEK.

750. HEYMANN. *On hay fever.*

A number of hay-fever patients were treated with thyroidin. Of nineteen patients, three stated that they escaped any attack, while in the remaining sixteen the attack was only a mild one. The severity of the action was in proportion to the length of the cure. MÜLLER.

f.—NASO-PHARYNX.

751. LINDT. *Clinical and histological observations on adenoids.* *Korrespondenzblatt f. Schweizerärzte*, 1907, Nos. 17 and 18.

752. CASABIANCA. Adenoid vegetations in nurslings. *Thèse de Bordeaux*.

751. LINDT. *Clinical and histological observations on adenoids*.

The histology of adenoids was investigated in fifty specimens. Lindt comes to the same conclusion as Brieger, that, notwithstanding the variations in constitution the histological findings in adenoids are nearly always the same, consequently they furnish no information as to the health of the individual or the origin of the hyperplasia. The author also discusses the involution of the pharyngeal tonsil, its liability to recur, and its physiological purpose. In regard to the last, the author belongs to the adherents of the protective theory. The indications and prognosis of the Gottstein operation are described. The author is not in favor of narcosis. Of fifty cases of adenoids, microscopic examination revealed tuberculosis in five, three adults and two children, who were constitutionally weak. At the time of operation there were no other evidences of tuberculosis. In one of the cases, a boy four and one-half years of age, a right-sided middle-ear tuberculosis subsequently developed. While tuberculosis of the pharyngeal tonsil was latent in this patient, it led in the middle ear to suppuration and caries. OPPIKOFER.

752. CASABIANCA. *Adenoid vegetations in nurslings*.

The author believes that adenoid vegetations in nurslings are not unusual, and unless early operation is resorted to, the prognosis of this disease is serious. OPPIKOFER.

SOFT PALATE, PHARYNX, AND BUCCAL CAVITY.

753. WHITE, E. H. Pathology of adenoids and adenoid tuberculosis. *Am. Jour. Med. Sciences*, August, 1907.

754. BYINGTON, J. F. A new adenoid curette for Rosenmüller's fossa. *Jour. Am. Med. Assn.*, Oct. 5, 1907.

755. MORSE, JOHN L. Adenoids in infancy. *Jour. Am. Med. Assn.*, Nov. 9, 1907.

756. GRADLE, H. Painless removal of adenoids. *Chicago Med. Recorder*, Nov. 15, 1907.

757. TOD, HUNTER. Venous angioma of the soft palate. *Proceedings of the Royal Society of Medicine, Laryngol. Section*, vol. i., No. 6, 1908, p. 13.

758. LEGG, T. P. So-called adenomata of the palate. *The Practitioner*, vol. lxxx., 1908, p. 333.
759. NEUMAN, DANIEL S. Improvement of the voice from tonsillectomy. *Denver Med. Times*, July, 1907.
760. HAGER, DANIEL. A tonsil pillar separator. *Jour. Am. Med. Assn.*, July 6, 1907.
761. CONNALL, J. G. Abnormal pulsating vessels in the pharynx. *Jour. of Laryngology*, vol. xxiii., 1908, p. 130.
762. ROBERTS, J. B. Improved methods in successful operative treatment of cleft palate. *Am. Jour. Med. Sciences*, July, 1907.
763. ROY, J. N. Primary melanosis of the palate; naso-buccal fistula of recent sarcomatous origin. *Med. Record*, Nov. 2, 1907.
764. FALLAS. Abscess of the neck of bucco-pharyngeal origin. *La presse oto-laryngol.*, 1907, Pt. 8.
765. BARTH. Physiology of the tonsils and the indications for their removal. *Deutsche med. Wochenschr.*, No. 49, 1907.
766. ORLEANSKI. On the blood- and lymph-vessels of the tonsils, especially in relation to the question of post-operative hemorrhage. *Russische Monatsschr. f. Ohrenhkl.*, etc., July, 1907.
767. CONSTANTIN. Tonsillar hemorrhages. *Thèse de Toulouse*, 1905.
768. HERVE. Treatment of tonsillar abscess. *Thèse de Bordeaux*.
769. TRAPENARD. Relation of buccal leucoplastica to syphilis. *Thèse de Paris*.
770. BLEGVAD. Black tongue (lingua villosa nigra). *Arch. f. Laryngol.*, vol. xx., Pt. 2.
771. OKUNEW. On the question of black hair tongue. *Monatsschr. f. Ohrenhkl.*, May and June, 1907.
772. BAUMGARTEN. A case of peripheral unilateral hypoglossal paralysis, with hemiatrophy of the tongue. *Wiener med. Wochenschr.*, No. 31, 1907.

753. WHITE, E. H. *Pathology of adenoids and adenoid tuberculosis.*

Seventy-five adenoids were examined histologically and in twelve cases this was supplemented by the inoculation of guinea-pigs. In five cases, histological evidence of tuberculosis was found, therefore this disease does not appear to be an important factor in the production of adenoid hypertrophy. But in the development of pulmonary tuberculosis the presence of adenoids may sometimes be direct channels of infection. Their importance is probably more often indirect by predisposing to catarrhal inflammation of the upper respiratory tract.

CLEMENS.

754. BYINGTON, J. F. *A new adenoid curette for Rosenmüller's fossa.*

The instrument is a side-cutting curette sharpened only on the posterior and superior portions of the loop. The ring forms an obtuse angle with the shank, which renders it possible to bring the entire posterior cutting edge in contact with the posterior-superior wall of the fossa and away from the posterior lip of the Eustachian orifice. CLEMENS.

755. MORSE, JOHN L. *Adenoids in infancy.*

Adenoids are considered a very common cause of colds in the head and snuffles in infancy, also irritating coughs without physical signs especially troublesome at night. Attacks of laryngitis and spasmodic croup, sleeplessness, even without marked symptoms of nasal obstruction, should create suspicion of their presence. The operation is considered free from danger and the only cure. CLEMENS.

756. GRADLE, H. *Painless removal of adenoids.*

After spraying the pharyngeal mucous membrane with cocain, a hypodermic needle is thrust as high as possible into the posterior wall of the pharynx, and a mixture of adrenalin and cocain is injected into the membrane. The needle is introduced through a blunt canula. After ten minutes the adenotomy will be painless. The same solution is used for tonsillotomies. The only pain experienced is when traction is made, especially with a snare. CLEMENS.

757. TOD, HUNTER. *Venous angioma of the soft palate.*

A large, smooth, globular swelling of a bluish-purplish color occupied the region of the soft and the posterior portion of the hard palate on the left side. It was markedly compressible on pressure and there seemed to be some absorption of the posterior part of the hard palate. Excision by operation seemed impossible. Ligature of the branches of the external carotid, in the hope of diminishing the arterial supply and thus rendering treatment by electrolysis less dangerous, did not affect the size of the growth.

HUNTER TOD.

758. LEGG, T. P. *So-called adenomata of the palate.*

The paper is based on six cases and is illustrated by four

plates showing microscopic sections of the tumors. These tumors occur at all ages. They are more frequently found in the soft palate and when in the hard palate are generally situated at its posterior part. The presence of a tumor is not infrequently discovered accidentally owing to the only symptom being that of inconvenience when it has reached a large size. Growth is usually slow and varies, frequently rapidly increasing in size after having existed for a long period. The tumors are usually solid, only rarely containing cysts. They have a definite capsule and are not pedunculated. Enucleation is the best and easiest method of treatment, an incision being made through the mucous membrane over the tumor.

In the cases quoted above there has been no recurrence varying over a period of twelve months to more than five years.

The most striking feature of these tumors histologically, is the complexity of the arrangement of the different elements and hence the difficulty of classification. HUNTER TOD.

759. NEUMAN, DANIEL S. *Improvement of the voice from tonsillotomy.*

That a complete tonsillotomy benefits the voice is based on the study of forty-four cases. After a period of two years, an examination of all the cases showed that the improvement had remained permanent. CLEMENS.

760. HAGER, DANIEL. *A tonsil pillar separator.*

This instrument is designed to overcome the difficulties of separating the adhesions of the tonsil and pillar. The blade of the instrument is set at such an angle as will conform to the anatomical curvature of the tonsil and fossa and, by reversing it, is adapted to the curvature of either back or front pillar. CLEMENS.

761. CONNALL, J. G. *Abnormal pulsating vessels in the pharynx.*

Twelve cases are cited; nine in adults, three in children. The condition was discovered in the course of routine examination of the pharynx. The pulsating vessel was situated behind the posterior pillar of the fauces and in most cases

ascended into the naso-pharynx. Pressure over the common carotid diminished or abolished pulsation. The vessel involved was thought to be the ascending pharyngeal, and not to be so rare an occurrence as generally supposed. Two plates are appended illustrating the abnormality.

HUNTER TOD.

762. ROBERTS, J. B. *Improved methods in successful operative treatment of cleft palate.*

It is recommended that cleft palate should be operated on as soon after birth as possible. Accompanying harelip should not be treated until after the palate operation. Brophy's tie-beam method is generally used when the operation is done during the first six months, and after this age the Lane method should be employed. Mechanical appliances to close the fissure are inferior to operative treatment, which has a low mortality.

CLEMENS.

763. ROY, J. N. *Primary melanosis of the palate; naso-buccal fistula of recent sarcomatous origin.*

This neoplasm did not begin with melanosis, and, sixteen years after it appeared, the spot on the palate was only 6mm in diameter and was on a level with the mucous membrane of the palate. No co-existing lesions of the eye or skin were present. The naso-buccal fistula appeared quite recently and has rapidly progressed.

CLEMENS.

764. FALLAS. *Abscess of the neck of bucco-pharyngeal origin.*

Four cases of severe abscess of the neck are reported where the entrance of infection was the lingual tonsil. Of these, three ended fatally. The author advises that these abscesses be opened early. There are two ways of reaching the abscess: (1) from the posterior wall of the sterno-cleido-mastoid muscle; (2) after the sterno-cleido-mastoid muscle has been pushed aside, below the middle aponeurosis of the neck. The use of chloroform is contra-indicated.

BRANDT.

765. BARTH. *Physiology of the tonsils and the indications for their removal.*

According to Barth, the tonsils like the lymph glands are a

protective apparatus and hypertrophy of these organs is to be regarded as increased function. Removal of the tonsils is necessary when their hypertrophy causes local changes, and when, owing to preceding inflammations they contain necrotic foci or abscesses which in addition to the local disease may cause a general infection. In operating it is desirable to avoid the formation of scar tissue and that the character of the mucous membrane be preserved. NOLTENIUS.

766. ORLEANSKI. *On the blood- and lymph-vessels of the tonsils, especially in relation to the question of post-operative hemorrhage.*

Complete description of the blood- and lymph-vessels of the tonsils. SACHER.

767. CONSTANTIN. *Tonsillar hemorrhages.*

There is no method for the removal of tonsils which precludes the possibility of hemorrhage. The various methods of controlling this hemorrhage are described, also suitable instruments are illustrated. The simple method of a firm gauze tampon held in contact with the wound by means of a long forceps is not sufficiently emphasized. OPPIKOFEK.

768. HERVE. *Treatment of tonsillar abscess.*

In every case of peritonsillitis operation alone is serviceable. Incision should be practised with the galvano-cautery, which prevents after-hemorrhage and by keeping the wound open facilitates the escape of pus. OPPIKOFEK.

769. TRAPENARD. *Relation of buccal leucoplasia to syphilis.*

In 126 patients with buccal leucoplasia, 89 suffered from syphilis, in 27 this condition was overlooked, and in 10 there was not the slightest evidence of syphilis. In spite of this last group the author believes that leucoplasia buccalis is of syphilitic origin and recommends that every case be treated with mercury. Even though a decided improvement is not always obtained by this treatment, still a worse result, as for instance the formation of carcinoma, can usually be prevented.

OPPIKOFEK.

770. BLEGVAD. *Black tongue.*

Ten cases are reported which were examined microscopically

and bacteriologically. The reports of other authors are given; the literature shows 110 cases. The author concludes that no hypothesis advanced up to the present is satisfactory. In the author's opinion, black tongue is due to an elongation of the filiform papillæ, possibly through irritation, and that these papillæ are dyed black in color, not from bacteriological causes but chemically through the ingesta (spices, wein, tobacco, or medicines). The treatment consists in the application of a 10% hydrogen-peroxid solution. VON EICKEN.

771. OKUNEW. *On the question of black hair tongue.*

Review of the literature and report of 2 cases, with careful histological examination of the hair, which was 1½ cm long. Satisfactory treatment was obtained by closely removing the hair and making daily application of a 1% to 2% solution of iodine and glycerine over the diseased parts for a long time. Smoking should be interdicted. SACHER.

772. BAUMGARTEN. *A case of peripheral unilateral hypoglossal paralysis, with hemiatrophy of the tongue.*

A child, five years old, was operated upon at the age of one and one-half years for enlargement of the lymphatic glands of the neck. Shortly after the mother noticed that the child's tongue was directed to one side and that its speech became indistinct. As the other cerebral nerves were normal, and as there were no brain symptoms, peripheral paralysis was diagnosed, the author being of the opinion that the nerve was probably injured at operation, the possible site being beneath the anastomosis with the nerve branches of the second and third cervical roots, as the genio-hyoid and thyro-hyoid were also involved. An illustration and a review of the literature complete the article. WANNER.

ILLUSTRATING DR. SHAMBAUGH'S ARTICLE ON "THE MEMBRANA TECTORIA AND THE THEORY OF TONE PERCEPTION."

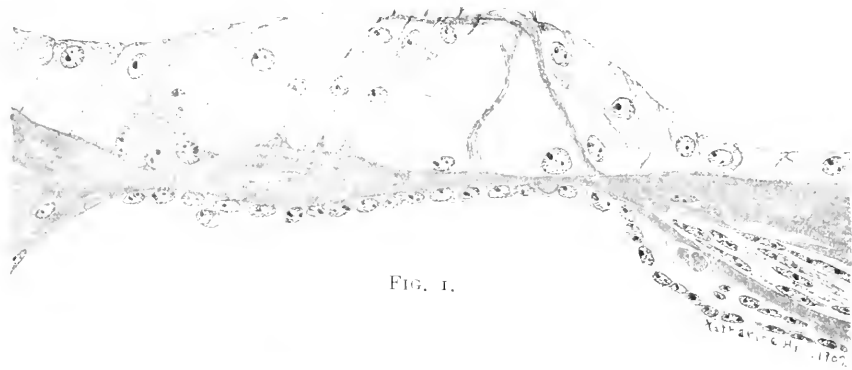


FIG. 1.

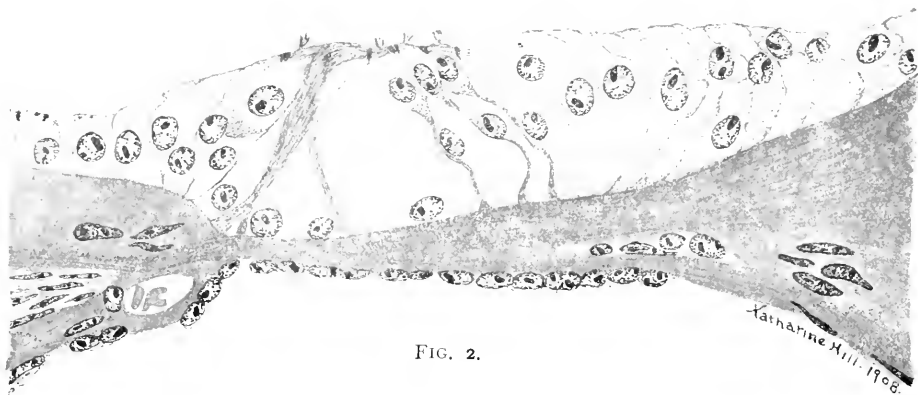


FIG. 2.

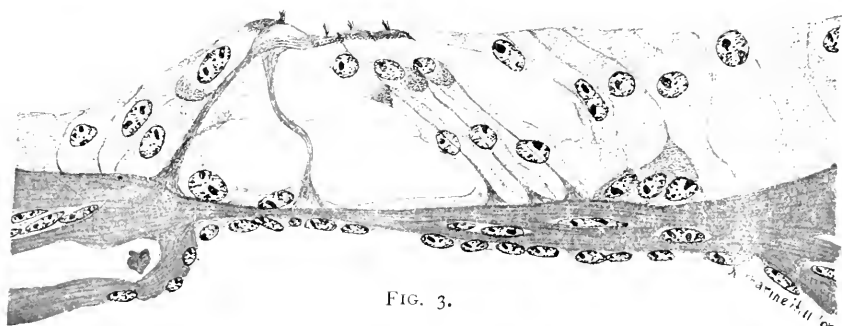


FIG. 3.

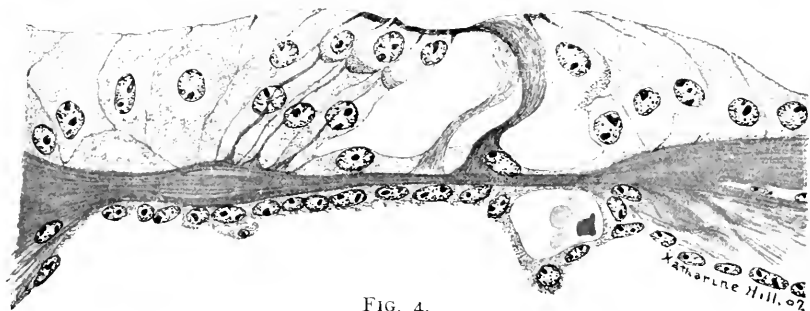


FIG. 4.

ARCHIVES OF OTOTOLOGY.

THE MEMBRANA TECTORIA AND THE THEORY OF TONE PERCEPTION.

(FROM THE HULL LABORATORY OF ANATOMY, UNIVERSITY OF CHICAGO.)

By GEORGE E. SHAMBAUGH, M.D., CHICAGO.

(*With four illustrations on Text-Plate XIV.*)

IN an article published in 1907¹ I called attention to what appeared to me to be fundamental objections to the theory that the membrana basilaris could be considered a vibrating structure. In this paper I presented arguments supporting the view that the membrana tectoria was the logical structure for stimulating the hair cells of the organ of Corti by responding in its various parts to impulses in the endolymph produced by the several tones. I shall aim here to present some additional facts in support of this theory.

We find in the labyrinth of the ear three distinct types of end organs, the organ of Corti in the cochlea, the macula acustica in the utricle and the saccule, and the crista acustica ampullaris in the semi-circular canals. These three types of end organs have a common origin in the primitive otic vesicle which is derived from invagination of the ectoderm. We may also assume that these three types of end organs, however they may differ

¹ "A Restudy of the Minute Anatomy of Structures in the Cochlea, with Conclusions Bearing on the Solution of the Problem of Tone Perception." *American Journal of Anatomy*, vol. vii., No. 2, pp. 245-257.

in structure and in function, have all had a common origin in a primitive end organ, which perhaps subserved in a rude way the several functions now performed by all three. This view is borne out by an examination of the three end organs as they now occur. They still preserve certain characteristics in common which point clearly to their having had a common origin. They have in the first place, a neuro-epithelium consisting of hair-bearing cells.

In the second place, each end organ has superimposed upon the hair cells a peculiar structure, which is of epithelial origin, and against the under surface of which in each instance the hairs of the hair cells project. In the organ of Corti this superimposed structure is the *membrana tectoria*. In the *macula acustica* it is the otolith membrane, and in the *crista acustica ampullaris* it is the cupula. This analogy can safely be carried one step farther and applied to the manner in which the hair cells of the several end organs receive stimulation. It is clearly evident that in both the *macula acustica* and in the *crista acustica* the stimulation of the hair cells is brought about by movements which the otolith membrane and the cupula, respectively, receive from impulses in the endolymph. It is but rational to assume that the stimulation of the hair cells of the organ of Corti would be accomplished by the movements in its superimposed epithelial structure, the *membrana tectoria*, these movements being derived from impulses passing through the cochlea. In other words, it is hardly rational to presume that the end organ in the cochlea would, in the process of its evolution from the primitive type, change completely its manner of receiving stimuli, placing the active agent in the basilar membrane rather than in the *membrana tectoria*. Such a change seems all the more improbable since the *membrana basilaris* is a connective-tissue structure of mesoblastic origin. One would naturally suppose that in a special sense-organ, like the cochlea, the struc-

ture which takes the important rôle of stimulating the hair cells would be a structure of epithelial origin.

A study of the membrana basilaris discloses a number of conditions which render it incapable of performing the rôle of a vibrating mechanism attributed to it by Helmholtz, and also by those who have attempted to substitute other theories for the Helmholtz theory of tone perception. In the first place, I have found that, as the lower end of the basal coil is approached, the membrana basilaris quite frequently disappears at a point where a perfectly formed organ of Corti is still found. Examples of this condition are found in Figs. 1, 2, which are taken from the labyrinth of the pig. In the second place, if the radiating fibres acted, as they were supposed to do by Helmholtz, as string resonators, then we would expect to find that as the lower end of the basal coil was approached, where these fibres become shorter, they would also become thinner and more tense in order to respond to tones higher and higher in the tone scale. As a matter of fact, just the opposite condition is found, for, instead of becoming thinner as their length diminishes, the fibres of the basilar membrane become thicker and thicker, and usually lose all resemblance to a string vibrator. See Figs. 1, 3. In the third place, there exists, as a rule, directly under the tunnel of Corti, a spiral blood-vessel, which, in the labyrinth of the pig, the sheep, and the calf, I found communicated by an occasional radiating twig with the blood-vessels in the ligamentum spirale. Blood-vessels, wherever found in the body, possess the faculty of contracting or dilating, depending on vasomotor conditions and upon the blood pressure. Now, according to the Helmholtz theory, each radiating fibre or group of fibres of the membrana basilaris has its own specific energy—that is, it can respond only to tones of a certain pitch. In this way only can we account for our ability to recognize pitch. It is quite clear that, with blood-vessels

attached to the basilar membrane, the contraction or dilatation of these vessels must alter the vibration of the membrane, so that the same fibre would respond to tones of different pitch, depending on the state of the blood pressure, etc. Such a response must lead to great confusion in the recognition of pitch, a condition, however, which does not occur. This vessel under the tunnel of Corti usually exists as a small vessel, but that it may occur as a large vessel is shown in Fig. 4.

Again, it has been repeatedly pointed out that the number of radiating fibres in the membrana basilaris is inadequate to account for all the tone differences that the ear is capable of perceiving. The attempt to account for this defect in the Helmholtz theory by attributing to the ligamentum spirale the function of putting the basilar on tension, either by the filling of the numerous blood-vessels in this part, or otherwise, palpably destroys the fundamental principle of this theory, which assumes that each radiating fibre or group of fibres has its own specific energy, which makes it possible for it to respond to the impulses of but one particular tone. If we imagine that by a varying degree of tension each fibre of the basilar membrane is capable of responding to several different tones, then it is quite clear that one of the fundamental facts of tone perception would be impossible—that of recognizing absolute pitch. There is still a more serious objection to the hypothesis that each radiating fibre or group of fibres can respond to a number of different tones, depending on a varying degree of tension of these fibres. According to this hypothesis, we must assume the impossible situation that each group of radiating fibres lies in readiness to respond to this or that tone, and that, by some unknown mechanism, information of the approaching impulses of a particular tone precede these impulses and attune the fibres to receive them.

An examination of the membrana tectoria, on the other hand, shows this structure to be admirably suited

for responding to the most delicate impulses passing through the endolymph. As I have pointed out before (*l. c.*), this membrane is a delicate, semi-gelatinous structure, with a specific gravity approximately that of the endolymph. That it has a certain degree of elasticity has been shown by the work of Hardesty.¹ It is a structure that must readily respond to the most delicate impulses passing through the endolymph. From these facts the following conclusions seem justified.

First, that the membrana basilaris is not the logical structure for stimulating the hair cells, and that it is anatomically incapable of performing such a function.

Second, that the membrana tectoria is the logical structure for applying stimulation to the hair cells, and that, furthermore, it is found to be anatomically admirably suited for responding to the most delicate impulses in the endolymph.

Just how the membrana tectoria responds to the impulses produced by the various tones is another question, and one not so easy to determine, since it is impossible to construct a substance with the physical properties of this delicate membrane in order to demonstrate its mode of responding to tone impulses. The response which the membrana tectoria gives to the impulses in the endolymph must be such as to account for the phenomena associated with tone perception. The most important of these is that of tone analysis, the ability which the ear possesses of analyzing into its component parts the complex impulses which impinge on the organ of hearing, when, for example, several tuning-forks are sounded at the same time and held before the ear. Then, too, the occurrence of tone islands, or of circumscribed defects in the middle of the tone scale, must also be accounted for. It is now generally conceded that the phenomenon of tone analysis,

¹ "On the Nature of the Tectorial Membrane and its Probable Rôle in the Anatomy of Hearing." *The American Journal of Anatomy*, vol. viii., No. 2, July, 1908.

as well as the occurrence of defects in the middle of the tone scale, are localized in the peripheral apparatus, and not centrally. Both the complex character of the end apparatus in the cochlea, and the peculiar secondary phenomena associated with tone perception, argue in favor of such a conclusion.¹ Moreover, tone islands and defects in the middle of the tone scale are known to occur only in connection with diseases involving the labyrinth.²

Helmholtz was the first to point out that the various secondary phenomena associated with tone perception find their most plausible explanation in the assumption that there exists in the organ of hearing a mechanism which takes the part of physical resonator, responding in one part of the cochlea to tones of a certain pitch and in

¹ McKendrick, *Schaeffer's Physiology*, page 1165, states that a peripheral tone analysis by means of physical resonators in the cochlea "seems *a priori* to be probable, for the following reasons: (1) The existence of such (resonating) bodies would give a natural explanation of many, if not all the phenomena (associated with tone perception); (2) the evidence of comparative physiology points to a gradually increasing complexity in the structure of all terminal organs of special sense, as if there arose a necessity for differentiation and discrimination in the effects of various kinds of stimuli; and (3) investigation into the action of all the sense organs, such as those of touch and temperature in the skin, of light and color in the retina, of taste in the tongue, and of smell in the olfactory region—all indicate specialization of function in the peripheral apparatus."

On page 1192 the same author says: "The most obvious objection to any theory which dispenses with peripheral analysis is that it leaves the exceedingly elaborate structure of the organ of Corti and, indeed, of the cochlea as a whole, out of account; or, to put the matter in another light, it assigns to that organ a comparatively simple function (like that of a vibrating membrane), and one which could be performed by a more simple structure. Furthermore, the holder of such a theory, while recognizing the analytic powers we undoubtedly possess, must refer these powers to the cortex cerebri, and practically admit that the problem cannot be solved."

² For a fuller discussion of the occurrence of tone islands, see "Demonstration einer Kontinuierlichen Tonreihe zum Nachweis von Gehördefekten," by Bezold, *Zeitschr. f. Psychologie und Physiologie der Sinnesorgane*, Bd. xiii., 1896; also Bezold's *Text-Book of Otology*, English edition, 1908, pp. 53-55.

another part to tones of a different pitch. The elaboration of this theory by Helmholtz and his followers still proves to be the most satisfactory explanation of these phenomena. Helmholtz first selected the rods of Corti as the resonators in the cochlea, but later gave this up and fixed upon the radiating fibres of the membrana basilaris as the structure which should respond in the various parts of the cochlea to the tones of different pitch, and by vibrating bring about a stimulation of the superimposed hair cells. From the facts here presented, the conclusion now seems justified that it is not the membrana basilaris, but the membrana tectoria that fills this rôle of stimulating the hair cells by responding to the impulses passing through the endolymph.

In order to understand just how this membrane responds to the various tones, we must first examine its physical characteristics, since this response is a physical one. The most striking character possessed by the membrana tectoria, apart from its delicate semi-gelatinous structure, is its great variation in size from one end of the cochlea to the other. As I have already pointed out (*l. c.*), from a tiny tuft at the beginning of the basal coil, measuring in the labyrinth of the pig not over 38 micra broad, it gradually increases in size, until near the apex of the cochlea it measures fully 432 micra broad. This enormous variation in the size of the membrana tectoria is undoubtedly an important factor in determining its mode of responding to the impulses coming from the various tones. My first impression, when I became convinced that the important function of stimulating the hair cells resided in the membrana tectoria, was that the tiny tectorial membrane found at the beginning of the basal coil would be capable of responding to the impulses produced by the high-pitched tones, whereas these same impulses would be inadequate to produce movements in the much bulkier membrane found in the upper coils of the cochlea. Each succeeding tone lower in the scale might

then be capable of producing responses in a larger and larger area of this membrane. The deepest tones that the ear is capable of perceiving would in this way produce stimulations of the tectorial membrane from one end of the cochlea to the other. Such an explanation of the action of the membrana tectoria would, it seems, readily account for the phenomena of tone analysis, since for each tone there would be stimulated a different group of hair cells, and the complex of nerve impulses which reaches the centre in the cortex cerebri would be different for every tone or part of tone. This explanation of the manner of action of the tectorial membrane fails, however, to account for the occurrence of tone islands, or of defects in the midst of the tone scale. Such defects, as is well known, occur over the lower end of the tone scale as the result of obstruction in the sound-conducting mechanism. They also occur at the upper end of the tone scale, and in the midst of the scale, where they are unquestionably due to pathological changes in the cochlea itself. This well-known phenomenon has been satisfactorily explained only on the assumption that the perception of the various tones takes place in separate and distinct parts of the cochlea. Circumscribed groups of hair cells, located in this or that part of the cochlear tube, when stimulated, would result in the perception of this or that particular tone. A stimulation of circumscribed groups of hair cells in the various parts of the cochlea can only be accomplished by assuming that the membrana tectoria responds in its various parts to tones of different pitch. The tiny tectorial membrane in the lower part of the basal coil would in this way respond to the vibrations of the high-pitched tones, while the tones lower in the scale would produce vibrations in areas of the tectorial membrane in the upper coils, where this membrane has been shown to be much larger. The nerve impulses from all of the hair cells stimulated by a particular tone come together in the auditory centre in the

cortex cerebri, where the tone picture forms the final step in the perception of this tone.¹

There is, of course, still one step lacking, and that is an absolute demonstration of the action of the membrana tectoria by the construction of a model which should reproduce the characteristics of this membrane. Such a demonstration, however, owing to the extremely delicate and complex character of the membrana tectoria, does not seem feasible. On the other hand, one is not justified in arguing that the tectorial membrane cannot act in the manner which logically we are led to believe it does, simply because the physicist may not be able to demonstrate what the action of such a membrane would be. Such an argument would be the same as to deny the possibility of a photo-chemical action occurring in the retinal structures in color vision on the ground that the chemist has never been able to demonstrate such action in the laboratory.

Since publishing my first paper on the subject of tone perception, there has appeared an article elaborating the same subject by Hardesty (*l. c.*). In this paper, page 132, Hardesty makes the assertion that my theory of tone perception is based on the assumption that the membrana tectoria is constructed by lamellæ, and on page 161 he states that some of his observations "are not in accord with the premises from which my theory follows." These are the questions of the relation existing between the hairs of the hair cells and the under surface of the membrana tectoria, and the question whether the

¹ As I have previously pointed out (*l. c.*), the necessary overlapping of the areas in the tectorial membrane stimulated by two tones close to each other in the tone scale does not conflict with this theory of tone analysis, since the nerve complex which reaches the cortex must differ for the two tones, however close they may be to each other in the scale. On the other hand, this overlapping of the areas stimulated by tones near each other in the tone scale has been shown by Helmholtz to offer the most plausible explanation of the secondary phenomena of tone perception—for example, the phenomena of beats.

striation seen in a cross-section of the tectorial membrane indicates the presence of fibrillæ or lamellæ. In reply it seems almost superfluous for me to state that, in the first place, my theory of tone perception is not based on the existence of lamellæ in the membrana tectoria, and in the second place, my conclusion as to the probable action of the membrana tectoria in the function of tone analysis is that this membrane responds in its various parts to tones of different pitch. Such an action need not be influenced in the least by the attachment to its under surface of the hairs of the hair cells, or by the substitution of fibrillæ for lamellæ in its construction. Hardesty expressed in this paper, in all essential points, practically the same conclusions contained in my paper. These are: first, that the membrana basilaris is not the logical structure for responding to the impulses in the endolymph, and that anatomically it is not suited to fill such a rôle; second, that the membrana tectoria is the logical structure for carrying out this function, for which it is admirably suited anatomically; third, that the variation in the size of the membrana tectoria from one end of the cochlea to the other is the physical basis which makes it possible for this structure to perform the function of tone analysis by responding in its various parts to tones of different pitch. In his discussion of how the membrana tectoria responds to impulses passing through the endolymph, Hardesty seems more or less undecided. In one place, for example, pages 167 and 168, he argues that high-pitched tones will stimulate only the small tectorial membrane found in the basal coil, while the lowest tones would produce undulations in the entire extent of this membrane. In another place, pages 165 and 166, he accepts the conclusion which I expressed in my paper, that the tectorial membrane takes the part of physical resonator by responding in its various parts to tones of different pitch, depending on the size of the membrane. "It is probable," he states (p. 165), "that no portion of the tectorial

membrane, when subjected to sound waves transferred to the endolymph, will undergo vibrations of sufficient excursion to impinge upon the auditory hairs, except those portions whose natural periods correspond to the vibration frequency of the waves affecting the endolymph." Hardesty refers to this conception of the theory of tone perception as a modification of the telephone theory. I am of the impression, however, that Hardesty's views are after all, in the essentials, in complete accord with my own, namely, that there is a peripheral tone analysis accomplished by the membrana tectoria. This is clearly implied from his explanation of tone islands, page 172. He contends that a localized (circumscribed) calcareous deposit in the membrana tectoria would result in producing a tone island. What he evidently meant was that such a deposit would produce a circumscribed defect, not an island, in the midst of the tone scale. Now, of course, a circumscribed interference with the action of the tectorial membrane, such as a calcareous deposit of this sort would occasion, could not produce a circumscribed defect in the tone scale, unless the converse were also true, viz., that the perception of this particular part of the tone scale would result from the stimulation of that part of the tectorial membrane the movement of which was interfered with by the calcareous deposit. This brings us back again to the conclusion expressed in my first paper, that the membrana tectoria responds in its several parts to tones of different pitch, in this way filling the rôle of a physical resonator.

EXPLANATION OF FIGURES.

FIGS. 1, 2, 3.—Organ of Corti from the labyrinth of new-born pigs. Sections from near the lower end of the basal coil, showing an absence of a vibrating membrana basilaris. Ocular 4. Leitz $\frac{1}{2}$ objective.

FIG. 4.—Section same as above, but with a large vessel attached to the under surface of the basilar membrane. Also an anomaly in the rods of Corti.

A CASE OF CEREBELLAR TUMOR INVOLVING THE AUDITORY NERVE.

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MY object in reporting this case is to show the value of a very careful testing of the ear in those cases of cerebral tumor in which there are no definite localizing symptoms.

On June 15th, Dr. Carmalt Jones kindly asked me to see T. B., who had been attending his Out-Patient Department at the Seamen's Hospital, and who showed the general pressure symptoms of an intracranial tumor without any very definite localizing symptoms (*i. e.* headache, vomiting, and optic neuritis).

On Examination: General Symptoms.—There had been transient neuralgia of the right side of the face and the corneal reflex on that side was diminished, indicating slight anæsthesia of the right fifth nerve. There was ataxia of the sensory type in both hands, and on standing up with heels together and eyes shut the patient exhibited a tendency to fall to the right side; this tendency was also present when the patient was walking about. Nystagmus was not present, but developed subsequently, the movements being "slow to right side with fine movements to left." No facial paralysis.

Special Symptoms.—The patient was a boiler-maker and complained of deafness in his right ear of seven years' duration; the onset had been gradual and the deafness had been

slowly progressing. Tinnitus was present and was of a humming character and, though varying in intensity at times, was always present, its onset being synonymous with the deafness. There was no history of pain or discharge.

On Examination.—Both membranes were slightly indrawn, the cone of light being broken on both sides. The membranes and mallei moved normally with Siegle's speculum.

Nose and Naso-Pharynx.—Nil.

Eustachian Tubes.—Quite normal when tested with catheter.

RIGHT.	TESTS.	LEFT.
On Mastoid	Weber.	Deflected to left.
Raised 2 inches	Acoumeter.	Over 12 feet.
ordinary	Voice.	
Negative.	Whisper.	4 inches.
Negative.	Rinne C.	Positive.
- 25 Seconds	Rinne C ² .	
Positive.	C. Mastoid.	22 seconds.
	Galton W.	
	Gellé.	
AIR COND ^N .		
	3 C 16	Diminished.
	2 C 32	
	1 C 64	- 28 seconds.
	C 128	
	C ¹ 256	Diminished.
Perception	C ² 512	
Over—35 seconds	{ C ³ 1024	
	{ C ⁴ 2048	

The testing showed that the patient was obviously suffering from a pure nerve deafness (bilateral).

As his occupation predisposed him to nerve deafness a difficulty arose, but as both ears were equally exposed they should have been more or less equally affected whereas in this case on the right side there was almost

complete deafness, whilst on the left side the hearing was not affected to anything like the same extent.

As the patient was obviously suffering from an intracranial tumor, and as the condition of the right ear could be produced by a tumor arising either from the auditory nerve or from the anterior part of the right cerebellar region and pressing forward on the nerve, it seemed obvious that this was the correct interpretation.

Mr. William Turner, under whose care the patient was admitted, came to the same conclusion.

At the operation, which was performed in two stages, a large infiltrating tumor was found, which involved the anterior part of the right cerebellar region and was attached above to the tentorium.

At the post-mortem examination it was found that the tumor had involved the nerve and had extended along it into the internal auditory meatus. On section the tumor proved to be a sarcoma. Microscopical examination of the nerve showed signs of degeneration; no evidence was forthcoming to show whether the nerve was primarily or secondarily affected.

As deafness is usually the first symptom in these cases, it seems to me that when a case presents itself in which there is severe nerve deafness, which affects one ear more particularly and for which no cause can be found, then this case ought to be very carefully examined by a neurologist with a view to excluding a tumor in this region.

It is interesting to note that the facial nerve escaped in this case and that in this class of cases it is often only very slightly involved, a condition which from its position one would have expected just the reverse.

With regard to Weber's test, I think this is just one of the cases in which it is of great value, confirming as it does the diagnosis of pure nerve deafness as opposed to oto-sclerosis complicated by secondary involvement of the internal ear.

NEGATIVE PRESSURE AS A THERAPEUTIC AGENT IN DISEASES OF NASAL ACCESSORY SINUSES, THROAT, EAR, AND MASTOID.¹

BY DR. EUGENE RICHARDS LEWIS, DUBUQUE, IOWA.

MY apologium for this paper rests upon the fact that most continental observers who have investigated this field of work have reported results unqualifiedly unfavorable to the induced hyperæmia methods of therapy in aural, nasal, and accessory nasal affections, whereas my own experience leads me to regard it as a method of first rank. The therapeutic procedures of Wright and Bier are complementary, and the advantage of combining vaccines and hyperæmia in combating infections has already been called to the attention of the medical profession in the field of general surgery by Dr. J. C. Hollister in a very able article written about eighteen months ago. The advantages in general of such a non-operative cure of infections are so obvious as to need no mention. The conservation of affected and contiguous tissues theoretically possible along these lines would nowhere in the body show more conspicuous differences in functional end-results, as compared with those end-results previously obtained along surgical lines than in the region of aural and nasal surgery. In the middle ear and mastoid, the amount of scar tissue left by an infection cured by such non-operative procedure must

¹ Read before Academy of Ophthalmology and Oto-laryngology at Cleveland, Ohio, Aug. 29, 1908.

be infinitesimal compared with that remaining after operative cure; the loss of mastoid bony substance would be in most cases so small as to be unappreciable, and it is upon these two changes that the impairment of hearing after otitis media suppurativa and mastoiditis depends. In labyrinthine suppuration, operative interference is uninviting, to say the least. Should such a curative measure prove practicable for application to this class of aural affections, it would prove a boon of inestimable proportions. In affections of the accessory sinuses of the nose, whether of acute catarrhal, acute purulent, or chronic purulent character, the measures advocated in this paper offer possibilities of conserving essential structures of turbinates and sinuses to an extent as yet unreached by any procedures hitherto undertaken. Bier's method of applying induced hyperæmia therapeutically has been the subject of a number of reports by continental observers. Bier's views on the subject of hyperæmic therapy in otology and rhino-laryngology, as expressed by Meyer and Schmieden, are as follows: "Unassailable proof has been rendered, principally at Bier's own clinic, under the supervision and co-operation of a well-known ear specialist, that a large percentage of cases of acute otitis media purulenta with mastoiditis, as well as of acute exacerbation of old middle-ear inflammations, can be cured without any major operation. Very recent cases heal under obstructive hyperæmia alone. If inspection of the drum membrane suggests an accumulation of pus in the middle ear, paracentesis is promptly done, or a former perforation is dilated. With continued artificial hyperæmia, the fever usually drops quickly, and the inflammatory process, with its pathognomonic pain, tenderness, redness, and swelling over the mastoid, gradually subsides." "The elastic band around the neck is worn regularly for from ten to eleven hours twice per day, or uninterruptedly for twenty-two hours with two hours' intermission. A correct technique is all-

essential." "In chronic cases of otitis media or those of cholesteatoma, artificial hyperæmia without operation should be discouraged." "The same beneficial effect may be observed in the complicating acute affections of the frontal sinus and the antrum Highmori." "Obstructive hyperæmia by means of the suction glass applied through the nostrils has been extensively tried for diagnostic purposes as well as for the treatment of suppurative affections of the accessory sinuses, including ozæna. However, specialists are still greatly at variance as regards its value in these affections."

In *Monatsschrift für Ohrenheilk.*, 1906, No. 5, Fleischmann reports: 24 cases of otitis media suppurativa, 8 of which were uncomplicated, 12 with mastoiditis, 2 chronic cases with acute mastoiditis and 2 with perichondritis. He concludes that the method is dangerous on account of the fact that pain is apt to be relieved at the same time that the disease is spreading, thereby lulling patient and surgeon into a sense of false security and allowing intracranial complications to develop. He is inclined to regard the method of Bier with disfavor.

In *Archiv für Ohrenheilkunde*, lxi., Isemer reports: 2 cases of acute otitis media suppurativa uncomplicated, 1 case of chronic otitis media suppurativa uncomplicated, 9 cases of acute otitis media suppurativa with mastoiditis. His conclusions are the same as Fleischmann's.

Horslauer in the *Münchener Medizin. Wochenschrift*, 1906, No. 34, reported: One favorable result in fourteen cases of chronic otitis media suppurativa, 30% of which came to mastoid operation. He reported on the Bier method as being a distinct advance in the treatment of otorrhœa, in spite of the poor showing of his statistics, certainly not a very convincing support of favorable views concerning the method. A year and a half ago, in a paper read before the Iowa State Medical Society, the writer broached his views on the subject of applying the methods here advocated to

aural and nasal infections. The limitations of a small private practice render impossible the assembling of statistical evidence for or against the methods advocated in anything like convincing array. He can only outline the working theory of the therapeutic application of negative pressure, report his own successes and failures, and give his conception of the reasons underlying failures on the part of those using constrictive hyperæmia.

The theory upon which these therapeutic measures are based is as follows: In the presence of an infection, the body cells throw out barriers of organized inflammatory exudate round about the infected focus in an attempt to limit the spread of infection. While this barrier is of great advantage in confining infection from spreading, thus protecting contiguous structures, it has this disadvantage, that it provides a wall within which bacterial propagation and toxin elaboration can go on more or less undisturbed. Serum, the natural menstruum of the bactericidal and antitoxic elements of the body, is found within the above mentioned barrier, but the difficulties of ingress and egress cause a serum stagnation within the infected focus, as a result of which the serum of the focus suffers a loss of bactericidal potency by reason of long-continued contact with bacterial protoplasm within the focus using up these elements of its composition. This serum of lowered bactericidal potential eventually steps out and its place is taken by fresh serum of higher bactericidal potential from the general circulation; but in many instances this serum exchange takes place so slowly that the bactericidal action of the serum elements is but very slight. In other instances, there may be a more rapid serum circulation through the infected tissues and still little or no antibacterial action on the part of the serum by reason of a low bactericidal potential of the serum of general circulation. In either case, until the occurrence of some change in conditions, the tide of victory would lie with

the invaders. Attempts to bring about such changes as might turn the tide in favor of the body cells, involve consideration of the invading organism and consideration of the individual attacked. The attacks of certain bacteria are, of their own nature, of short duration. We are wont to speak of diphtheria as a self-limiting disease. Why? Because whether interfered with or not, the attack will have terminated of its own accord within certain comparatively short limits of time; at the end of which, if death has not supervened, the patient will have recovered. The attacks of other bacteria are of the opposite type. Unless successfully interfered with, the process may go on for an indeterminate period of time. The mention of bacteria under such a classification is relevant only in this, that it enables us to put out of our consideration at the start all those of the first or self-limiting type. Inasmuch as bactericidal measures suitable for application to bacteria within the body tissues have not as yet been developed to a point where decisive effects can be accomplished within the ordinary lifetime of such short-term insults, the principal fight in such instances must be directed, not against the bacteria themselves, but against their life products. This is essentially the field for antitoxins, not for vaccines or induced hyperæmia.

All bacterial infections not falling in this short-term group are fit subjects for attack along the lines of vaccines and induced hyperæmia therapy. Some along the borderline between these two classes may properly be attacked both antibacterially and antitoxically. The general condition and the specific resistance of the individual attacked by the infection have very important bearings upon the subject of antibacterial therapy. In one patient, it may be that the specific resistance to an infection will be found very low (witness low specific resistance to staphylococcus in acne subjects); in another with the same infection, it may be found very high. Vaccination is indicated in the first case, not in the second case.

Thus when using induced hyperæmia in combating infections, it will be of considerable importance in some cases to combine with this measure a judicious use of exogenous vaccine, in order to secure a high antibacterial potency of the general circulation; and in other cases such vaccination will be quite unnecessary, the secondary effect of the induction of hyperæmia proving adequate in maintaining high opsonic content in the general circulation.

There are obvious and important differences between the constrictive method of inducing hyperæmia, used by the Continental observers, and the method advocated in this paper. Constriction results in venous stasis, which in turn causes back pressure in the arterio-venous capillary anastomoses and thence in the arteries. Stasis is followed by dropsy into the tissues drained by the constricted veins. Consider for a minute what this means in chronic sinusitis of one of the accessory nasal sinuses for example. Obstructed drainage due to inflammatory changes in the sinus mucosa has already resulted in retention of muco-purulent matter with retention and pressure symptoms; possibly it has even reached the stage where the oedematous mucosa, lacking room within the cavity for its increase in bulk, has forced its way through the normal openings into the nose in the shape of polypi, still further obstructing the exit of pus from the cavity. Increase by constriction this already obstructive dropsy, and it is small wonder that effects of an unfavorable rather than of a favorable nature should be noted. The same unfavorable effect of constriction should be expected in acute mastoiditis, in which condition alarming symptoms are always due to blocking up of the exits of the infected cavities, rendering drainage insufficient. Freeing the exits of all such cavities, not only of polypi, but of all swelling of adjacent tissues and mucosa, removing all secretion possible by a continuous stream of warm alkaline solution, which tends to dissolve it and

syphon it from within the cavity, using from two to four quarts of lavage solution at a sitting, we open up our exits as widely as possible. Following this up by negative pressure, which sucks out of the cavity a large amount of the retained secretion and sucks into the tissues lining the cavity a sudden great excess of fresh serum and lymph and phagocytes, we have not only still further increased our drainage by mechanical means, but we have dislodged stagnant lymph and serum of low opsonic value and brought in an excess of lymph and serum of high opsonic value. After these changes in the tissues have been accomplished, the treatment is at an end. The elasticity of the tissues allows a reactionary subsidence of the acute distension caused by the negative pressure. In the very nature of things such subsidence can occur only by the moving forward into the general circulation of the excess of fluid which has caused the distension, as there is possible no backward outflow. So it must result in the outflow of the *old stagnant fluids* whose opsonic potential is already exhausted, and the replacement of those fluids by lymph and serum of high opsonic potential.

CASE I.—March 12, 1907, male, eighteen years, brought by family physician for operation. Acute otitis media suppurativa of one week's duration. Bacteriology: *B. lanceolatus* and pus cocci. *Status præsens*: Pain, prostration, fainted twice to-day; slight sanguinous pus discharge through punctate perforation in ant. inf. quadrant of membrana tympani. Mastoid swelling and extreme tenderness. Temperature 103° . Anæsthetized; free incision from floor up through memb. flaccida into attic. Suction applied for ten minutes, after which patient was kept at absolute rest, with occasional application of hot-water bag to mastoid. Suction was repeated daily. The following 72 hours, temp. fluctuated between 102° and 99° . Pain was practically nil; discharge free. Two days later, temperature became normal. Swelling and tenderness in mastoid disappeared. Patient gained strength and felt almost well. Discharge had

ceased by the thirteenth day, when patient went to work. A month later hearing was full normal.

CASE 2.—March 24, 1907, male, thirteen years. Mastoiditis complicating acute exacerbation of chronic otitis media suppurativa A. S. following scarlet fever at four years of age. Has had occasional exacerbations of mild character, never before as severe as this one. Profuse discharge of thick, intensely foul pus for three days, followed by diminution in amount of discharge, great increase of pain, œdema and extreme tenderness over mastoid. Auricle stands out at angle of about 30° . Teat-like pouting perforation in ant. inf. quadrant of *Mt.* Temp. 102.8° ; prostration and marked febrile symptoms. Bacteriology: *Staphylococcus* and *pneumobacilli*. Incision carried from floor through perforation deep into attic. Suction applied for ten minutes. During first forty-eight hours temperature fluctuated between 103.8° and 100° and pain disappeared under daily suction; after fourth day, temperature remained normal and patient could come to office daily where suction was applied for from eight to twelve minutes. On the eighth day all mastoid œdema had disappeared, some tenderness still remaining. On the fourteenth day, began instilling absolute alcohol after applying suction. This was continued daily for two weeks, when discharge had almost disappeared. Very large faucial tonsils were enucleated and naso-pharynx curetted. Suction applied twice weekly until, two months and a half after coming into my hands, all discharge had ceased, lower anterior quadrant of drumhead healing partly adherent to inner tympanic wall. Hearing improved from inability to hear thirty-six-inch watch on strong pressure, to watch at eight inches. One year later heard same watch at twelve inches.

CASE 3.—May 10, 1907, female, twenty-two years. Acute otitis med. sup., two days no perforation. Temp. 99.6° , intense pain, no mastoid symptoms, made free incision of drumhead. Bacteriology: *B. lanceolatus*. First twenty-four hours patient was much improved, during following ten days improvement was interrupted by occasional pain in ear and some mastoid tenderness. By twentieth day discharge had almost ceased. At this time symptoms of an exacerbation presented, perforation began to pout, mucoid

secretion changed to finely granular pus, and mastoid pain began. Made free incision from floor to attic and applied suction for ten minutes, evacuating an enormous amount of pus; temperature has been normal since tenth day. Eight days later I was compelled to make an extensive simple mastoid operation, finding granulation tissue and pus from tip to zygomatic cells. Healing was uneventful.

CASE 4.—December 9, 1907, female, twenty-three years. Patient presented furunculosis of post. inf. canal wall; had been previously operated for acute mastoiditis, simple operation having been done. During this operation I found it necessary to curette through a small portion of post. bony canal wall, the site of which dehiscence chanced to be that selected by the present furuncles. After thirty-six hours of intense pain, during which time post. wall was so swollen as to hide all view of the tympanic membrane, patient experienced sudden spontaneous subsidence of all symptoms, including swelling. The next twenty-four hours, explanation of this unlooked-for eventuation of the ext. otitis became apparent. The old mastoid scar became reddened, œdematous, and tender; temp. 102° ; when suppuration had occurred beneath the cuticle-periosteum, pus found ready escape backward through the dehiscence of the post. bony canal wall into the old healed mastoid cavity. I at once incised the old scar, incision being followed by free discharge of pus. Bacteriology: *Streptococcus* and *pneumobacilli*. In spite of drainage mastoid continued to discharge through scar incision for over a month, patient feeling well and strong however, and pursuing occupation as high-school teacher. I made many applications of negative pressure to discharging sinus during the next four weeks, but failed to secure cessation of discharge, though there was great diminution in amount of pus. I finally operated, cleaning out old mastoid cavity, incising *Mt* which had been intact, and establishing gauze drainage from *cavum epitympanicum* backward to mastoid incision. Healing was interrupted by a week of facial erysipelas, after which it was uneventful. Hearing a year after first operation had been eight inches for thirty-six-inch watch. Now, six months after this second operation, she hears same watch only $\frac{1}{2}$ to $1\frac{1}{2}$ inches. My first two cases of acute mastoiditis had

responded so nicely to treatment by negative pressure, that I was quite a little disappointed at being compelled to operate on the subjects of my next two applications of this method. Case 4, however, I was inclined to consider hardly a fair test on account of the entire change in the local circulatory and cellular conditions in this region, due to the previous operation. I decided, however, after these two experiences, to make a longer application of negative pressure to the next acute mastoiditis so treated. And in this connection let me make it clear that I have not applied this treatment to every acute case, nor do I consider it adapted to all acute cases. There are certain cases which early present the picture of quickly spreading virulent infection with rapidly deepening intoxication, intense and steadily increasing prostration. These cases I would certainly operate at the earliest possible moment without attempting any conservative delay.

CASE 5. March 19, 1908, female, twenty-eight years. Had been treated for acute catarrhal Eustachian salpingitis three months ago, which gradually improved without perforation of *Mt*. Five days ago developed acute otitis med. sup. in same ear. Temp. 101.4, thick purulent discharge for past three days, mastoid swelling, redness and tenderness. Anæsthetized and incised *Mt* from floor through memb. flaccida. Applied negative pressure for twenty minutes, evacuating enormous quantity of sanguinous pus. At end of twenty-four hours temp. 101.8, headache, malaise, severe pain. Anæsthetized again and reopened incision, applying negative pressure forty minutes. Bacteriology, diplobac. lanceolat. In twenty-four hours temp. 99.2; felt much improved; free discharge from drumhead incision. Two days later applied negative pressure five minutes without anæsthetic and repeated this cautiously every day for next week. Except for an intercurrent furunculosis of canal, patient made an uninterrupted recovery. Six weeks after first operation, hearing for thirty-six-inch watch was twenty-four inches.

CASE 6.—Female, sixty-two years. Chronic sup. otitis med.; extremely foul pus, discharge dating back to scarlet fever in childhood. View of drumhead obscured by large polypi; these being avulsed large perforation in inf. post.

quadrant was exposed. Applied negative pressure without anæsthesia for ten minutes, followed by 95% alcohol instillation. Repeated neg. pres. and alcohol daily. A week later avulsed more polypoid tissue. At the end of twenty-four days perforation had entirely closed, having contracted adhesions with inner tymp. wall. Hearing had improved from not hearing thirty-six-inch watch on firm pressure, to hearing same watch at three inches. Perforation has remained absolutely closed for four months.

CASE 7.—April 17, 1908, male, thirty-nine years. Exacerbation of chronic catarrhal sinusitis, three days, referred to me by family physician. Temp. 100.8, has reached 103. Intense pain in head, particularly on left side, in inf. max. and frontal regions, tenderness on pressure over frontal and inf. max. sinuses. Has used warm Seiler's douche for past three days with slight relief. Pain has grown steadily worse; gr. $\frac{1}{4}$ morph. hypo. necessary this A.M. Applied cocaine to swollen turbinates and contiguous mucous membranes and applied negative pressure, evacuating thick pus. Bacteriology, pyocyanus and pus cocci. Relief of symptoms was immediate, within three minutes. After full shrinkage of mid. turbinates found large true hypertrophy of ant. end right mid. turb. which I snared off at once. The left had been the larger of the two and most of pain had been on left side, but after cocainization there was no bogginess, so this was not touched. Ordered continuation of Seiler's douche. Relief of pain was complete from 10 A.M. until 3 A.M. next morning, when it again became so intense as to require morphia. Neg. pressure applied at 9 A.M. after cocainization and relief of yesterday again experienced. This was continued daily for about a week, then successively thrice weekly, twice weekly, once weekly until by the end of six weeks no pus had been seen for a week or more, nothing but non-purulent mucus, and this had about ceased to appear in appreciable quantities. Since the third day patient had been free from pain and has been able to go back to his work as supervising architect.

CASE 8. Male, thirty-five years. Had been under my care off and on for nearly three years on account of chronic catarrhal sinusitis involving frontal ethmoidal and sup. maxillary

sinuses on each side, occasionally worse on right, occasionally on left. Patient had repeatedly refused proposed operative measures for relief of intranasal conditions, which included very thick deflected septum. Had also been in the hands of other rhinologists occasionally, all competent men, and had once submitted to some turbinate operation at the hands of one of these men, upon which ensued an unfortunate hæmorrhage which only served to confirm him in his opposition to subsequent operative proposals. He had run the gamut of frontal and maxillary lavage, topical applications to infundibula and turbinates, alkaline nasal lavage at my hands, and of catarrh inhalers, jellies, etc., at his own hands, without signal relief. On the occasion of one of his excruciating headaches during a purulent exacerbation of his trouble, I packed the infundibula with cotton saturated with cocaine solution as I had often done for him, and after thoroughly shrinking the tissues, I applied negative pressure to the nares. The effect was particularly satisfactory because of the fact that it was comparable with effects of many other procedures applied under similar conditions on the same patient; within five minutes after evacuating a large quantity of greenish pus, all pain had disappeared. Pursuing this plan of treatment, at first daily, later thrice weekly, twice weekly, and at last once weekly, I was able to keep the patient almost free of headaches and that sensation termed "wooden-headedness," "balloon feeling," etc. Three subsequent purulent exacerbations have since been successfully aborted by early application of negative pressure.

CASE 9.—Female, sixteen years. Was referred to me by family physician because of headaches. She had had gastrointestinal disturbances and he had been inclined to attribute the headaches to this source, though treatment for them along this line had proven unsuccessful. She was highly myopic, wearing 4.50 sph., and was of a catarrhal type. I found she had a history of frequent attacks of tonsillitis and pharyngitis and had recently had a mild otitis med. suppurativa. Curettement of the nasopharynx and enucleation of faucial tonsils was first done, after which I turned my attention to the nose, which was in a condition of marked hypertrophic catarrh. After shrinking the structures contiguous to the infundibula

and washing thoroughly with a large quantity of warm alkaline solution, I applied negative pressure for about eight minutes and succeeded in evacuating a large amount of very thick stringy yellow pus, most of which came from the sup. max. sinus, to the great surprise of the patient, who declared she had never been aware of the presence of such secretion. Her discomfort and headache promptly ceased after the discharge and she remained free from symptoms for two days, when I reapplied the negative pressure with same results. This course of treatment was continued at first thrice weekly, later twice weekly, at last once a week. The character of the evacuated secretion changed to mucus and the amount gradually diminished to a normal quantity. Occasionally after exposure she suffered slight exacerbation of symptoms, with a tendency toward increase in quantity and purulence of secretion, but her general progress was steadily towards what seems now to be a complete cure.

CASE 10.—Female, twenty-two years. April 22, 1908. History of morning headaches for over two years, often so severe as to prostrate her. Pain comes on about 8 or 9 A.M. and lasts till from 1 to 4 P.M.; vomiting occurs frequently at the height of the pain but slight relief of pain is experienced afterward. Narrow high arched palate, thick septum, very much hypertrophied nasal mucosa showing true general papillary hypertrophy. Lower and mid. turbinates in contact with septum. After shrinking the infundibular regions as much as possible, negative pressure evacuated much tenacious yellow pus containing pus cocci and some diplobacilli. Patient experienced great relief at once. I pursued the usual course of thrice weekly and later biweekly applications of this treatment. After the first four weeks had passed in comparative comfort, patient having had only an occasional abortive attack of headache, while superintending moving of her household goods to a new home she was exposed and suffered sudden exacerbation, chill, temp. 102, intense pain in head, nausea. She came at once for a treatment at 2.30 P.M. I was called at 7.30 P.M.; found her frenzied with pain, temp. 102.8. I was compelled to give morphia gr. $\frac{1}{2}$ hypo. in two injections two hours apart before there was any appreciable diminution of symptoms. Later, after being confined to bed

for three days by this attack, patient resumed treatments every day with very unsatisfactory results. The relief she had experienced at the beginning of the treatments was conspicuously absent and at times I suspected her discomfort had been actually increased by the negative pressure. After a week of non-success, I advised her to give up all treatment and watch developments with a view to some operative procedure in case symptoms should demand interference. Five weeks later she reported having been almost entirely free from symptoms and she had had no bad headaches. After four months patient reports having had no return of headaches though she has occasional discharge of large amount of thick mucoid secretion. In this case I am somewhat at a loss to account for the apparent increase in symptoms while under treatment, promptly followed by disappearance of all discomfort on discontinuing negative pressure. It may be that absorption of the inflammatory hyperplastic tissue in the sinus mucosa was interfered with by the frequently induced congestions and that on ceasing to induce hyperæmia such absorption did occur with beneficial subjective results. I am more inclined to believe that this case was one not well adapted to treatment along these lines and that the improvement noted just now is only a temporary fluctuation toward betterment, such as is shown by most cases of chronic sinusitis suppurativa.

CASE II. Male, forty-six years. Has had chronic catarrhal rhino-sinusitis for years, has been cauterized, chromicized, etc., at different times. For past few weeks has had balloon feeling in head, morning headache, discomfort in frontal ethmoidal and sup. max. regions, slight tenderness on pressure, with more or less obstruction to nasal respiration. Somewhat irregular septum, boggy turbinates with little true hypertrophy. Infundibular structures were well shrunken, after which warm douche and negative pressure were applied. Evacuation of considerable grayish thickened mucoid secretion was followed immediately by relief of symptoms. Treatment was continued with gradually increased intervals until within three weeks there was no recurrence of symptoms and patient felt perfectly well. Patient, who is a physician, is extremely enthusiastic over the success of this method of treatment,

declaring it to be far the pleasantest and most efficacious treatment he has ever experienced.

CASE 12. Female, twenty-six years. Has well marked beginning atrophic rhinitis with usual purulent sinusitis; crusting and odor have been source of great discomfort to patient. Has been treated for over a year by topical applications and lavage without improvement. Warm alkaline lavage followed by a negative pressure applied daily for ten days. At first free hæmorrhage occurred at each treatment and a large amount of foul yellow thin muco pus was evacuated. Hæmorrhage ceased after five or six treatments, discharge grew less in amount, lost its foulness, becoming more and more mucoid. Subjective symptoms ameliorated, odor disappeared. After eight weeks, during which intervals between treatments were gradually prolonged, patient was so far improved that she was instructed to stop treatment, using only warm lavage at home once or twice daily, and to return in case there was any increase in symptoms. I have not seen her in over two months, but she reports no return of odor or of sufficient crusting for her to be conscious of its presence.

In summing up these cases together with about twenty other cases not detailed, because of a desire to avoid unnecessary and tiresome repetition, I must report that the results of applying induced hyperæmia therapy in the manner described have been so satisfactory in my hands that I cannot but regard it as a therapeutic method of indubitable worth. It is not recommended as applicable in all cases. In properly selected cases, it is of superior merit in that it offers a cure without the operative hazard, in many cases without even the hazard of a general anæsthetic; and it is of especially superior merit in that it offers a cure with the least possible loss of tissue and disturbance of anatomic relations and consequently the greatest possible conservation of function.

Applications of negative pressure for relief of purulent sinusitis should always be preceded by thorough shrinkage of intranasal structures. The technique of applying

negative pressure to the nose and ear is simple and needs no detailed description. Any practical means of maintaining continuous suction may be made use of. An ordinary air-pump operated by water or electric power seems best adapted to the purpose. In the office I use the chemist's vacuum water-pump suggested by Dr. Frank Brawley, of Chicago, to whom I wish to acknowledge a deep indebtedness for having brought to my attention this excellent device for applying negative pressure in these regions. For portable use I have impressed into service an old glass ear syringe of 100cc capacity. In using either pump or syringe, it is better to use non-collapsible tubing rather than the ordinary rubber tubing. To the intake tube is attached a suitable tip of glass or hard rubber. The Siegel otoscope is very satisfactory for use in the ear. The olivary tip or the glass tip devised by Dr. Will Walter are best adapted for use in the nose. The nostrils are occluded, one by inserting the nasal tip, the other by pressure from the patient's thumb. The negative pressure is then applied and at the same time the patient is instructed to swallow, to start the act of saying K, or to open the mouth very widely. Any one of these acts will bring the soft palate up against the posterior pharyngeal wall, and the negative pressure will hold it in this position, thus closing off the posterior openings of the nasal chambers and allowing the partial vacuum formation in the nares. A great advantage of the water vacuum pump over other methods of inducing negative pressure is the absolute control allowed the operator over the amount of negative pressure applied. By opening or closing the water-cock, the negative pressure can be varied immediately according to the desire of the operator. After a considerable experience in using this treatment in purulent sinusitis, I have come to realize that posture plays a very important part. I have often been unable to evacuate pus from a maxillary sinus, for example, while the patient is in an upright

position, only to find that by placing the head for several minutes previous to the application of the negative pressure in such a position as to cause the contents of the sinus, by gravitation, to overlie the natural opening or openings, an enormous discharge of thick pus follows immediately upon the reapplication of even slight negative pressure in the new position. I would lay special stress upon the importance of posture and of non-collapsible tubing. It is convenient to have a small bit of glass tubing inserted a few inches away from the tip so that the operator may observe the passage of pus from the nose. It is also a great convenience to have a four-ounce wash-bottle at some convenient point along the tube for collecting the secretion removed.

PHLEBITIS WITHOUT THROMBOSIS AS A CAUSE OF OBLITERATION OF THE SINUS IN CHILDREN.

BY DR. S. KRAMM, OF BERLIN.

Abridged translation by Dr. GERHARD H. COCKS, New York, from
Zeitschrift f. Ohrenhkl., Vol. LIII., p. 111.

A NUMBER of cases of obliteration of the sigmoid sinus have been described in literature. Streit mentions this condition as an accidental finding at operation. Hölscher twice found granulation tumors instead of sinus, and once met with a sinus degenerated into granulation tissue; he thought that there had been a previous sinus phlebitis with destruction of the vessel. Still other cases of sinus obliteration have been reported in the Austrian Otological Society (Dec. 30, 1905) under the heading "Healed Sinus-Thrombosis" (Alt, Alexander, Fry). Further observations have been made by Warnecke, Zaufal, and others.

We thus see that it is not very rare for an inflamed sinus which has not received operative treatment to lead to obliteration of the sigmoid. That this must always be caused by a previous thrombosis of the sinus, is a supposition which is evidently quite generally held. Hoffman's case may be quoted as a classical example.

In a four-year-old child, with abscess and cholesteatoma in the mastoid, ichorous fluid escaped from the posterior cerebral fossa through a defect in the posterior wall as large as a dime; there was also an extra-dural abscess present.

Division of the sinus showed the wall much thickened; the lumen existed for a distance of 1cm only and contained blood-tinged discolored fluid. Centrally and peripherally from this point the sinus was obliterated by firm connective-tissue adhesions between the walls.

The same conditions were present in Case 1 reported by Warnecke, who observed obliteration of a sinus in both directions by a completely organized connective-tissue thrombus. There was an abscess lying on the sinus.

However, in some other cases of obliteration of the sinus, an inflammatory thrombosis cannot be brought forward as the cause. Here Case 2 of Warnecke belongs

He opened the mastoid of a three-year-old girl, and found a moderately large cavity filled with foetid pus and granulations, in the bottom of which the sinus was exposed, covered with granulations; further down the sinus was covered by a sequester. When opened, it was seen to be free from blood from the mastoid tip to the knee. After passing the sound posteriorly moderate bleeding occurred; no bleeding anteriorly, where it was impossible to follow up the vessel further because it was completely obliterated in the region of the tip. No organized connective-tissue masses of thrombotic material could be recognized between the sinus walls.

In Warnecke's opinion either previous phlebitis caused primarily the agglutination of the walls after the lower portion of the sinus had collapsed in consequence of a thrombus located above, or the agglutination was secondary to disintegration of a thrombus which had existed at this point. Warnecke assumes that a thrombus was the direct or indirect cause of the gluing together of the walls.

Muck found a sinus collapsed in the sigmoid groove, in a child nine years old with a large extradural abscess, extending over a portion of the occipital lobe and cerebellum. Healing resulted quickly without the sinus being opened. Muck thought that the sinus was without

doubt thrombosed in the place where it was covered with granulations in the region of the abscess, since it was in a collapsed condition further anteriorly, *i. e.*, centrally.

Leutert's case—a seven-year-old girl who had been ill with scarlet fever $3\frac{1}{2}$ months before—was successfully operated on account of necrosis of the mastoid process and a purulent fistula 6cm behind the insertion of the auricle leading into the mastoid emissary. The sinus could not be recognized. It was not possible to establish the occurrence of a previous pyemia from the history.

These three cases have the following points in common: They occur in children whose ages are seven, nine, and eleven years respectively; an extradural abscess was either present or had existed presumably before the destruction of the bony sulcus; and all three healed without interference with the sinus itself.

Obliteration of the sinus may take place in still another way than through an inflammatory thrombosis, viz., through compression and phlebitis by an extradural abscess with resulting agglutination of the vessel walls. The two following cases observed by me are examples:

CASE 1.—H. F., six years old, 1903; scarlet fever, followed by left-sided otorrhœa till May, 1906. On July 2, 1906, profuse discharge left ear, severe pain over left half of head, vertigo, high fever, no chills. Admitted to hospital, July 13, 1906.

Examination.—T. 38.7° P.M. *R. ear:* Moderate purulent secretion in canal; heart-shaped defect in lower part of drum; upper half thickened and somewhat reddened; tympanic mucosa red. *L. ear:* Auricle at right angles to scalp; soft parts over mastoid swollen and tender upon pressure; fluctuation over mastoid fossa; in external canal abundant purulent secretion; canal narrowed by collapse of superior wall so that only the posterior part of the drum was visible, here bulging and red. Background of eyes normal. Moderate-sized adenoid. Paracentesis, left. Removal of adenoid.

July 14, 1906.—Mastoid operation, left. Periosteum thickened; 3cc pus between bone and periosteum; bone intact;

numerous large bloody spots in mastoid fossa; mastoid cells filled with bloody swollen mucous membrane. In the antrum was a slight amount of pus and swollen mucosa.

During the two following weeks the patient had slight fever, but nevertheless gained in weight. She remained in bed on account of the persistence of moderate discharge from the ear. On August 14, when she left her bed for the first time, the T. shot up to 39° , and sharp pain was experienced behind the left ear. On August 19, T. was 37.1° A.M. and 38.1° P.M. Eyes normal; general condition good. Moderate purulent secretion in canal. Slight tenderness behind the field of operation.

August 20.—Secondary operation. Wound scraped. The corticalis behind the mastoid was brittle and roughened over an area the size of a shilling. When removed with the internal table 5cc of pus was evacuated. The dura of the posterior fossa was covered with granulations, necessitating wide removal of the bone. After the granulations were removed the dura was apparently healthy except in one small sharply defined spot, where it was yellowish-green in color. Next to this, corresponding to the course of the sinus, the granulations were firmly attached to the dura. When the apparently destroyed dura was removed, I came upon a sinus completely empty (just below the knee). Anteriorly and posteriorly from this point the lumen was obliterated, the walls being adherent. There was no thrombus present.

The further course was uneventful, apart from a light attack of erysipelas. After a few days the secretion from the ear disappeared. When examined about two months after operation, the retro-auricular wound and the perforation in the drum were closed. Hearing for whisper fairly good.

CASE 2.—W. R., five and a half years old; no previous ear disease. July, 1906, measles. Early in August, discharge and then pain, first in the right and then in the left ear. Since August 21, 1906, increasing swelling behind left ear without appreciable impairment of general health. Admitted to clinic August 24.

Examination.—*Right ear:* Moderate tenderness over mastoid fossa; slight amount of pulsating purulent secretion in canal; posterior part of drum membrane red and bulging;

Paracentesis. *Left ear:* Tenderness upon pressure over mastoid fossa; small fluctuating swelling just behind this point, limited posteriorly by the posterior mastoid border, and accompanied by infiltration of the soft parts; moderate purulent discharge in canal; drum completely absent, except for a triangular piece above which contains remnant of malleus; tympanic mucosa thickened and red. Background of eyes: Papilla somewhat reddened and sharply defined. General condition good.

Operation.—Left mastoid opened; subperiosteal abscess. Behind mastoid fossa is a bony fistula 0.5cm broad. After enlarging the fistula and scraping away the granulations, I came upon the white tabula interna of the sulcus which lay completely free over an area 2cm long and 1cm wide. The antrum and mastoid cells were filled with greatly swollen and hyperæmic mucous membrane, but contained no pus. While examining the internal table of the sulcus, a drop of pus appeared. The internal table yielded slightly to my pressure, and finally this portion came away in toto as a sequester. This was followed by 3cm of pus, which emptied itself from the interior of the cranial cavity. The sinus wall and surrounding dura were covered with flabby granulations. In the middle of the granulations was a linseed-sized perforation in the outer sinus wall; the inner wall of the sinus, grayish-white and thick, lies free. The lumen of the segment of the sinus adjoining the opening was obliterated by agglutination of the walls. Recovery uneventful.

In both these cases we have to do with an acute mastoiditis, which originated without any special cause in Case 1, while in Case 2 it followed measles. In Case 1 the middle-ear suppuration on the diseased side was said to have existed for three years, yet the examination and clinical course make it probable that the opposite ear was affected with the chronic suppuration, while the operated ear was probably healthy until a short time before. In Case 2 we are dealing with an acute exacerbation of a chronic middle-ear suppuration.

Both patients developed an extradural abscess and

sinus phlebitis in connection with an acute mastoiditis. In each case the cause was an inflammatory focus in the bone. In the first case the diseased area remained after the mastoid operation. In Case 2 there was no previous operation on the antrum. The inflammation within the antrum and contiguous cells receded by draining through the large defect in the drum. In the distant cells, corresponding to the upper posterior portion of the mastoid, the infectious material had opportunity to do its injurious work.

The symptoms which point to extradural abscess and sinus phlebitis, apart from the unusual site of the diseased bone, were the following:

In Case 1, after the mastoid operation a moderate rise of temperature to 38.0° C. and over was observed during the evening for a month. When the child left its bed for the first time the fever reached 39.4° C., severe pain was experienced behind the operative wound, and a profuse discharge from the middle ear made its appearance, after the canal had been dry for several days.

Case 2 was operated the day of admission to the hospital. Here there were no symptoms worthy of note. Certainly the general condition and the temperature did not point to any severe complication.

The essential point in both cases is that it was possible to observe the manner of healing of an inflamed sinus in the natural way.

Through disease of the bone in the neighborhood of the sigmoid sulcus, the wall of the sinus was either inflamed or perforated by the pus. Thus there originated a perisinus abscess and an inflammation of the outer sinus wall, with the formation of granulations. The abscess and granulations, in spite of the slight amount of pus, led to flattening of the sinus, thus making it possible for only a slight amount of blood to circulate. The inflammation of the outer wall gradually progressed from the superficial to the deeper layers, until finally all layers

of the vessel wall were involved and increased in thickness. When the innermost layer became diseased, the lumen was no longer present. Thus we explain the coalescence of the inner surfaces of the sinus from the operative findings.

As the inflammatory narrowing of the vessel lumen increased and the walls began to adhere, the venous blood could no longer pass, and was shut off from the diseased portion of the sinus. A thrombosis would have resulted if the lumen had been patent up to the time that the innermost layer of the sinus took part in the inflammatory process. But the lumen was either previously or simultaneously obliterated—therefore there was no thrombosis.

What course each case would have pursued without operative interference is naturally difficult to state. Possible complications are rupture of the pus externally through the soft parts, leptomeningitis, or brain abscess. However, it could never have come to a pyæmia or sepsis in consequence of sinus phlebitis.

Through the report of my two cases, I should like to emphasize the fact that sinus phlebitis may lead to obliteration of the vessel without the occurrence of a previous inflammatory thrombosis. I believe I have demonstrated this as far as it is possible by examination upon the living.

If a thrombosis has not taken place in an inflamed and diseased sinus, a certain amount of danger exists—not necessarily very great—as long as the blood circulates through the diseased channel. The prognosis in a case of sinus-inflammation which leads to a simple permanent closure is good, in contradistinction to the outlook where there is thrombo-phlebitis, provided the diseased bone is removed and the pus drained.

My patients were children five and six years old respectively. In the cases of Warnecke, Muck, and Leutert, mentioned above, the obliteration of the sinus may well

have resulted from sinus phlebitis and compression in consequence of an extradural abscess without inflammatory thrombosis. These patients were also children, between seven and eleven years old. As far as these few instances warrant conclusions, it appears that the course of sinus disease portrayed above occurs preponderantly, if not entirely, in childhood. The explanation is to be found in the anatomic relations.

The sigmoid groove in children is considerably flatter than in adults. In the latter, the outer wall of the sinus on cross section has about the form of a half-circle; but in children, on the contrary, it is shaped more like a flat arch, while the inner wall of the sinus stretches almost straight across the sulcus. In children, then, the outer wall of the sinus lies considerably nearer the inner wall than in adults. If an abscess presses the outer wall in an inward direction, the lumen is obliterated earlier in children than in adults. Given the same pathologic changes in the region of the sinus, when the inflammatory process has involved the innermost layer of the external wall, in children there results an inflammatory sinus-obstruction by obliteration of the lumen; while in adults an inflammatory sinus thrombosis ensues, on account of the persistence of the vessel lumen.

This consideration raises the question: Does not the simple, *i. e.* non-thrombotic, sinus-obstruction occur fairly frequently in childhood?

The answer to this question must be determined in the future.

THE TREATMENT OF ACUTE MIDDLE EAR
SUPPURATION, WITH NIPPLE-SHAPED
PERFORATION, BY ASPIRATING THE PUS
INTO THE EXTERNAL MEATUS.

BY DR. O. MUCK, OF ESSEN (RUHR).

Translated from *Zeitsch. f. Ohrenhkk.*, Vol. LVI., No. 1, 1908, by Dr.
M. J. BALLIN, New York.

IN the 9th number, 1907, of the *Münchener Med. Wochenschrift*, the writer reported his observations on the influence of the hyperæmic treatment, produced in the external meatus by aspiration, on suppurations of the tympanic cavity, and called attention to the fact that the suction method proved very beneficial in suppurations in which the perforation in the drum was unfavorably situated, and especially in those forms in which the perforations had a nipple- or cone-shape. Owing to the practical interest which such cases afford, the writer would like to go more fully into the details of this new method of treatment, which, as it appears, may be looked upon as the most advantageous.

If we take into consideration the pathological changes which take place in middle-ear suppurations, we may understand why the acute middle-ear suppurations associated with bulging of the drum at the posterior superior quadrant have an unfavorable prognosis. Between the long process of the incus, stapes, opening into the antrum, and medial wall of the tympanic cavity, there is a loose connective-tissue net-work, which swells up considerably

during inflammatory processes, and the meshes of which become filled with pus (similar to a wet sponge); this separates the larger portion of the tympanic cavity from the pneumatic accessory spaces which are usually also diseased, so that, in spite of perforation or paracentesis of the drum, there is pus retention. This retention often necessitates, therefore, the opening up of the mastoid process (Kümmel.)¹

A far more important and harmful factor is that the epidermis of the drum forces its way into the small perforation which in itself is very narrow, during the time that the cone is developing, whereby the opening is made still smaller, as has been shown by Katz.²

That dilatation of the narrow cone-shaped perforation or the making of a counter-opening (Schwartz) does not always bring about the desired result, is experienced by every practitioner. More satisfactory results are obtained by removing, or, in other words, crushing the projections (Haug). Aspirating the inflamed tissue of the tympanic cavity through the external meatus, by means of my suction apparatus is a method which does less harm to the parts, and which may be said to abort the process.

Amongst one hundred and fifty cases of acute, purulent middle-ear inflammation, I have observed five cases with a marked cone-shaped perforation in the posterior superior quadrant during the subacute stage. These cases recovered in about eight days under the suction treatment. The histories of these cases are briefly as follows:

I.—F. V. Thirty years old. Suppuration from the ear for three weeks following an attack of influenza. Patient

¹Kümmel, "Über die Ursachen des verschiedenen Verlaufes der akuten Mittelohreiterungen," *Verhandl. d. Ges. deutsch. Naturf. u. Ärzte*, 1904.

²Katz, "Zur Frage der bei akuten eitrigen Mittelohrentzündungen vorkommenden Trommelfellzapfen, deren Therapie und histo-pathologische Struktur." *Archiv f. Ohrenheilk.*, vol. ii, Parts 3, 4.

complains of an intense feeling of tightness in the head. A cone-shaped perforation, behind and above. After three applications of the suction method, whereupon a large quantity of pus could be aspirated through the perforation, recovery took place within five days.

II.—K. G. Eleven years old. Pain in the ear for fourteen days, marked bulging and redness of the drum, behind and above. Paracentesis. Profuse discharge of pus. After three weeks a distinct cone-shaped perforation developed. Mastoid process painful on pressure. Renewed pain in the ear. After daily aspiration of the pus, recovery and closure of the perforation took place at the end of eight days.

III.—G. N. One year old. Persistent suppuration for five weeks in spite of early paracentesis. Occasional retention of pus, accompanied by fever. A marked cone-shaped perforation, which developed during the last few weeks. Recovery after ten days, with closure of the perforation. Aspiration was performed, in this case, every other day.

IV.—F. N. Eight years old. Profuse purulent discharge from the right ear. Cone-shaped perforation. On the second day, a large quantity of pus was aspirated, whereupon the cone retracted entirely, and a perforation could not be detected even with a magnifying glass.

V.—P. W. Twenty years old. Acute suppuration of the ear of several weeks' standing. Cone-shaped perforation, behind and above. Pus, tenacious and mucous in character. After five applications of the suction apparatus, the profuse purulent discharge ceased entirely. Closure of the perforation.

The writer would like to state the following in reference to the technic. It is essential that one performs the suction intermittently, that is, one aspirates several times at one sitting. The conical portion of the glass suction tube which has been devised by the writer is hermetically introduced into the external meatus, the rubber air-bag, which is of moderate size, is then compressed, the outer opening of the suction tube is closed with the left index finger, and the air-bag is allowed to expand again. After several seconds, one lifts the index finger and upon re-

moving the glass tube one is able to see a purulent discharge in the meatus which was previously well cleansed. Every time the meatus is sponged out, pus can be aspirated 5-10 times or oftener. Aspiration is no longer continued if the exudate assumes a hemorrhagic color. This method is carried out daily. The idea that the narrow perforation becomes occluded by the suction is purely theoretical. The writer became convinced from the cases treated by him that fluid can be aspirated at any time. The writer never enlarged or removed the cone-shaped protrusion on the drum.

That such cases, which are supposed to have an unfavorable prognosis, recover in so short a time, depends firstly on the fact that the tympanic cavity is freed of a large part of the purulent fluid; secondly, that the tissue infiltrated with pus, just as a swollen sponge, to use the simile of Kümmel, is deprived of a certain amount of fluid; and lastly, that the epidermis of the drum which is turned into the perforation is drawn out by the suction. In two cases, the writer saw the cone-shaped protrusion considerably lessened on the following day, after several applications of the suction apparatus at one sitting.

Aspirating with a strong air-bag is also not painful, as one learns from the statements of adult patients. Children who cry habitually, naturally, also cry during this manipulation.

The physical action of the removal of the fluid from the tympanic cavity through the perforation, by means of aspiration in the external meatus, can be clearly appreciated from the description of the following apparatus.

A glass tube, one end of which is enlarged, is divided by a glass partition which has an opening similar to a cone-shaped perforation. The dilated portion represents the tympanic cavity; the partition, with the cone-shaped orifice, the perforated tympanic membrane; and the remaining portion the external meatus. If one fills the supposed tympanic cavity completely with a fluid which

has nearly the consistency of pus, as for instance glycerine or the yolk of an egg, so that no air bubbles are visible in the bulb, one can aspirate at highest one drop, even if repeated several times. If, however, a few air bubbles are present, then one can aspirate, if performed intermittently, an amount of fluid up to the level of the opening in the partition. If the dilated portion is stuffed with cotton, which has been impregnated with the yolk of an egg, one sees, after each suction, one or more drops of fluid exude, and after cessation of the aspiration, one or more air bubbles rise in the dilated part through the cone-shaped opening, a well-known physical phenomenon. We therefore have without doubt in the living the same physical action, inasmuch as the tympanic cavity, in suppurative inflammations, is never completely filled with fluid; this can be objectively proven when there is an exudate in the middle ear, in that the air bubbles which enter the Eustachian tube during an act of swallowing, blowing the nose, yawning, and screaming can at times be seen by otoscopic examination. This experiment, therefore, has proved that it is physically possible to aspirate fluid from the tympanic cavity through an opening in the drum. After emptying the middle ear of some of its inflammatory fluid, the absorbing action of the hyperæmia (Bier-Klapp) brought about by the suction is an important factor in bringing about a recovery. If a diseased condition of the mastoid process is evident, the desired result can naturally no longer be obtained by this method.

EPIDERMIC CYSTS, FOLLOWING TRANSPLANTATION IN THE CAVITY PRODUCED BY THE RADICAL MASTOID OPERATION.

BY DR. W. SCHOETZ, HEIDELBERG.

Translated from *Zeitsch. f. Ohrenheilk.*, Vol. LVI., No. 1, 1908, by Dr. M. J. BALLIN, New York.

IN the 39th volume of the *Archiv f. Ohrenheilk.*, Leutert describes two tumors the size of a small pea, which developed in the ear of a patient who had had a radical mastoid operation on account of the formation of cholesteatoma, four years previously, and in which the structure resembled the epidermic cysts observed by Reverdin and Garré.

Leutert states in his paper that such structures may develop, if the bone cells, in which the invading epidermis is entirely or partly preserved, become shut off secondarily by the formation of granulations at the borders, or by the transplanted epidermis. Cysts containing fluid, which are apparently lined with mucous membrane and which have taken their origin from remnants of mucous membrane which has been allowed to remain, have been repeatedly observed after radical mastoid operations.¹ A few epidermic cysts are also mentioned,² but more concise observations in reference to the formation of such cysts following the radical mastoid operation and

¹ *Sitzung der Österr. otol. Ges.* 26, iii., '06. *Monat. f. O.*, 1907, xli. 2, p. 92.

² *Sitzung der Österr. otol. Ges.* 27, x., '06. *Monat. f. O.*, 1896, xxx., 11, p. 439.

transplantation have not been reported, as far as the writer could ascertain.

Under these conditions, the following observations may be of some interest not only to the otologists, but also to surgeons and pathologists.

I. Miss O. Eighteen years old. Radical mastoid operation performed on the 2d of April, 1902, for an otitis media chronica desquamativa. A retroauricular pedunculated flap was made according to Passow,¹ which however did not take well as can be seen from the history of the case. On the 16th, transplantation of Thiersch's skin flaps into the wound. On the 9th of June, the ear was completely dry. In the beginning of April, 1905, the ear which had been operated upon began to suppurate again, and at the same time lancinating pains were present at the tip of the mastoid. As the pains disappeared after a few weeks, the patient noticed a swelling behind the ear, which induced her to return to the clinic on the 3d of May, 1905. With the exception of a small suppurative portion at the orifice of the tube, the tympanic cavity was dry and covered with epidermis. A fluctuating tumor the size of a pigeon's egg extended from the tip of the mastoid into the fossa retromandibularis. The skin was somewhat reddened and movable. There was no pain on pressure. The swelling was incised and proved to be an epidermic cyst, the contents of which was of a pulpy, sterile nature. During the extirpation, another cyst, also filled with an epidermic pulp, was found farther anteriorly. As soon as the extensive wound surface became covered with epidermis, with the exception of a small granulating surface upon which a drainage tube had been resting, the patient was discharged in the beginning of June. In the middle of May, 1907, the patient was again admitted into the clinic on account of a painful swelling behind the operated ear. From the lower border

¹ The first plastic method in the radical mastoid operation as devised by Passow (*Eine neue Transplantationsmeth. f. d. Radikaloperat. bei. chron. Mittelohreit.*, 1895), which was used in this case, has been abandoned by the writer for better methods (*Festschr. f. Lucae*, Berlin, 1905, Passow, *Gehörgansplastik bei der Radikaloperation chron. Mittelohreiterung*).

of the retroauricular opening, a linear scar ran down to the angle of the inferior maxillary bone. The cavity produced by the operation was dry and lined with healthy epidermis. Behind the uppermost portion of this scar, a tense swelling somewhat sensitive to pressure, measuring about 3cm in length and 1cm in width, and the upper white extremity of which already protruded into the cavity itself, was found beneath the slightly reddened movable skin. An incision was made around the tumor, under local anæsthesia, which was then dissected out, whereupon its contents, which was of an atheromatous nature, escaped through a small tear. Microscopic examination showed that the cyst wall was lined with squamous epithelium consisting of several layers, which rested upon a tense layer of connective tissue having no papillæ.

II.—Miss W. Sixteen years old; had a radical mastoid operation on the 30th day of April, 1907. The bone was not sclerosed, the antrum was small and filled with granulations. The plastic was made just as in the first case. The wound having pursued an uninterrupted course, the patient was discharged on the 5th of May, for ambulatory treatment. One week later, a Thiersch's skin flap taken from the arm was transplanted after the removal of unhealthy granulations, which became adherent without any difficulty. When the patient again visited the clinic at the end of October, 1907, swelling was found about the size of pigeon's egg; this nearly filled the retroauricular opening, is supposed to have developed soon after the operation, had a broad base and showed distinct fluctuation. Its contents which was yellow, like the yolk of an egg, was readily visible through the thin, easily wrinkled skin, which contained small tortuous blood-vessels. There was also a purulent discharge from the tympanic cavity. On the 29th of October the tumor was extirpated, under local anæsthesia.

After incising the skin around the cyst it was removed in toto from the smooth, bony trough to which it adhered at circumscribed parts. The wound pursuing a normal course, the patient was discharged on the 23d of November. Microscopic examination: The skin over the tumor consisted of a rather thick epidermis from which atrophic hair follicles

and some glands extended into the somewhat loosened up corium. Towards the edges of the wound it is considerably thinner; its papillæ are flat. Below the centre of the excised skin flap, the corium, which is moderately rich in round cells, is transformed into granulation tissue; this is very rich in round cells, is infiltrated with small groups of fat cells which form a portion of the cyst wall, and continues at the side in the form of a tense connective-tissue capsule poor in cells. This connective-tissue capsule, which completely surrounds the tumor, has on its inner surface a marked desquamating epidermis consisting of four to five layers of cells, the thickened borders of which seem to continue over the granulating part. The contents is formed by loose masses of scales arranged in layers like that of epidermis.

The traumatic epidermic cysts in the hands and fingers, first described by the surgeons, are supposed to be due to a cutting off of a portion of the epidermis which has been produced by a trauma of the subcutical layer. This theory can be confirmed by the fact that such cysts have been produced experimentally by Kaufmann, Ribbert, and others, and also by the post-operative development of such structures after the implantation of epidermis¹ or after incomplete excision of an ingrown nail.²

Pels-Leusden³ has recently expressed the opinion that at least a portion of traumatic epithelium cysts takes its origin from injured appendages of the skin, glands, or hair follicles. That analogous structures may also be produced by covering the epidermis with transplanted skin flaps, the writer has not found described anywhere except in the paper of Leutert.

That this possibility is emphasized by an otologist is really not surprising, as nowhere are the conditions as favorable as in an ear which has been operated upon for

¹ Worz, "Traumat. Epithelcysten," *Bruns' Beitr.*, xviii., 1897.

² Martin, "Beitr. z. Lehre von d. traum. Epithelcysten," *D. Zeitsch. f. Chir.*, xlviii., p. 597.

³ Pels-Leusden, "Traumat. Epithelcysten," *Deutsch med. Wochenschr.*, 1905, No. 34.

cholesteatoma or a desquamative otitis. Even when exercising the greatest care it may happen that, in some corner, a piece of epidermis escapes the eye of the operator, and is covered by the transplanted flap. This danger is still increased if the transplantation is undertaken immediately at the completion of the mastoid operation, as is the case in the original plastic operation of Passow; however, the delicate smooth cholesteatomatous membrane becomes separated from the bone much less readily than from the granulating surrounding area.

In the first case, in which the skin flap took poorly, it was therefore possible that, although no epidermis was allowed to remain which had been covered over, epidermis pushed its way under the flap from the surrounding skin of the neck or of the external meatus. Six weeks later Thiersch's skin flaps were transplanted, and the granulations which surrounded the skin flap were curetted; the epidermic areas, which extended somewhat under the pedunculated flap, were destroyed. These factors may perhaps most readily explain the multiple occurrence, and the peculiar long form of these cysts.

In the second case, there was no cholesteatoma, and there also seemed to be no desquamative otitis present, as the wound healed by primary union, the skin flap having taken well; and if we do not wish to assume that a partial epidermization of the mastoid cells had already existed which was overlooked at the time of the mastoid operation, the only possibility which remains is that the cyst developed from mucous membrane which later underwent a metaplasia, or from the remaining portions of epidermis. The latter supposition could not be demonstrated microscopically and the relatively loose connection of the cyst with the overlying skin, as well as its firm adhesion to circumscribed portions of the bone, speaks rather in favor of the first. That a metaplasia of the mucous membrane into an epidermic cyst occurs, is very

probable according to an observation of Brühl,¹ who found directly beneath the surface in an aural polyp, which was covered only with cylindrical epithelium and which contained cylindrical epithelial cyst, a large cavity which was lined with broad, stratified, squamous epithelium, and contained cholesteatomatous masses. According to the experiments of Ribbert² the epithelium not infrequently changes its character, if it grows in a foreign or an inflammatory area; or in other words under altered conditions necessary for its development.

The thin pulpy character of the contents of the cyst is only partly attributed to the degeneration of the epidermis generally observed in atheromata; it can, however, be partly explained by the fact that, not as in a true cholesteatoma in which a completely closed sac forms the cyst, a portion of the wall still contains granulations, as has been demonstrated at least in the second case. The contents also show that these tumors belong to the same class as the epidermic cyst first observed on the fingers, in which the fluctuating contents was mistaken for a hygroma in several cases, and distinguishes them from cholesteatomata which Borst described as a structure having a white, silk-like lustre, a dry, crumbling consistency, and a characteristic stratified leaf-like form. Leutert's tumors show on microscopic examination a greater resemblance to the true cholesteatomata, so that the original aural affection in his case may also have possibly been a true cholesteatoma, in spite of the fact that, according to the history of the case,³ no epidermis was found in the middle ear and its accessory cavities at the first operative opening up of the mastoid process.

¹ Brühl, "Beitr. z. path. Anatom. d. Gehörorg.," *Zeitschr. f. Ohrenheilk.*, 1905, xlix., p. 34.

² *Zeitschr. f. Chir.*, xlviii., p. 575.

³ *Comp. Arch. f. Ohrenheilk.*, xxxiv., p. 267.

FUNCTIONAL EXAMINATION OF THE ORGAN OF HEARING IN DEAF-MUTES.¹

A CONTRIBUTION TO THE CLINICAL PATHOLOGY OF THE
INNER EAR. (INCLUDING A TABLE OF THE
COLLECTED MATERIAL USED IN OUR
EXAMINATIONS.)

By G. ALEXANDER AND G. W. MACKENZIE

Translated from the *Zeitsch. f. Ohrenhkl.*, Vol. LVI., No. 2, 1908, by
G. W. MACKENZIE, Philadelphia.

CONSIDERABLE time has elapsed since the last thorough examinations have been made upon deaf-mutes (Bezold, Brühl, Wanner, Alexander and Kreidl, Frey and Hammerschlag, Pollak, and others), during which time our knowledge of clinical otology has been greatly increased, especially through improvements of our examination methods of the static labyrinth.

It was found necessary to examine a sufficient amount of material, adopting all of the earlier known together with the more recent methods, so far as they could be depended upon; the results of these examinations will be given later.

Our examinations have been conducted with the intention of solving some disputed questions, and especially that of **labyrinthine equilibrium disturbances**, which recently has been a subject of so much discussion. In this relation, as well as the galvanic examination methods and the examination upon the goniometer, the clini-

¹ From the Ear Department of the Allgemeinen Polyklinik in Wien.

cal examinations in the following paper have been made after the methods of G. W. Mackenzie.¹ At the present time there is considerable difference of opinion concerning the question of equilibrium disturbances; however, the existence of positive equilibrium disturbances in an appreciable number of deaf-mutes has been found uniformly by all examiners. The question though, why in some cases and not in others disturbances of equilibrium are present, appears, according to previous investigations, entirely unsolved, and the different appearing opinions in the literature are supported solely by theoretic suppositions.

According to the findings in the individual cases, we were able to group our material as follows:

I.—Deaf-mutes with complete non-reactibility of the cochlea (absolute deafness) and static labyrinth.

II.—Deaf-mutes with partial destruction of the inner ear (hearing rests) and positive irritability of the static labyrinth.

III.—Deaf-mutes with partial destruction of the inner ear (hearing rests) and complete destruction of the static labyrinth.²

IV.—Deaf-mutes with total destruction of the cochlea (absolute deafness) and positive irritability of static labyrinth.

This division permits of a better grouping of the cases than was heretofore possible. Originally the deaf-mutes were grouped solely according to the quantity of hearing rests (Itard). Later came the qualitative division with emphasis upon the hearing rests, for the various pitches of the voice (Bezold). Alexander and Kreidl, upon the basis of comparative and anatomical examination

¹ See *Arch. f. Ohrenheilk.* and *Monatschr. f. Ohrenheilk.*, 1908.

² See Neumann: "Über ein Fall zirkumskripter Labyrinthkrankung und einen Fall von Neuritis vestibularis" (Rud. Zack), Österreich. Otol. Gesellschaft, Sitzung vom Oktober, 1907, *Monatschr. f. Ohrenheilk.*

upon animals with congenital labyrinth anomalies, by applying special methods of examination, succeeded in separating congenital from acquired deafness.

By the division into congenital and acquired forms of deafness it becomes clear just where earlier mistakes had been made, because here we are too much dependent upon the history which, as we know, is very unreliable, especially in cases of early acquired deafness (deafness acquired in first or second year of life).¹

Alexander and Kreidl pointed out this unreliability, which, at the same time, led them to exclude the discussion of individual cases.

The material used in our examinations consisted of pupils of the k. k. Taubstummen Institutes in Wien, from which material earlier examinations have been made by Kreidl, Pollak, and Alexander.

To the Director of the Institute, Dr. Fink, and the Principal, Mr. Gabriel, we wish to extend our thanks for their kindness and courtesy in supplying the material and for their further assistance. The Principal, Mr. Gabriel, was kind enough to furnish us with the history and progress of the pupils in articulation, lip reading, and general capability, arranged in table form, for which we thank him in particular. The data of the individual cases comprise:

1.—Name and age.

2.—History: a brief report is given by the parents at the time of the child's admission to the institute—which, as already stated, is in many cases unreliable. We will touch upon this subject later.

¹ Hammerschlag (*Z. f. O.*, vol. 45) attempted, with success, to show the mistake of such a division by exact observation of the accompanying phenomena (*Multiplizität, kongenitale Augenkrankheiten, directe und indirecte Aszendenz*). In this manner he was able to establish the fact of similarity in the behavior of the vestibular apparatus of the congenitally deaf and that of dancing mice. (Compare Alexander and Kreidl, *Pflüger's Arch.*, Bd. 38).

3.—Classification noted in articulation, lip reading, and general capability.

(1—very good; 2—good; 3—sufficient; 4—barely sufficient; 5—insufficient.)

4.—Otosopic findings.

5.—Subjective noises (ringing, hissing, etc.)

6.—Functional examination of the organ of hearing with especial attention to hearing rests.

7.—Functional examination of the non-acoustic labyrinth (static labyrinth).

(a) Spontaneous nystagmus in relation to its character (rotatory or horizontal), the direction (right, left), and intensity (apparent upon looking to the same side, straight ahead, and upon looking to the opposite side).

(b) Irritability of the static labyrinth to turning (examination upon the turning stool).

(c) Galvanic irritability recorded in milliampères, with kathode to the ear and anode to the ear.¹

8.—Equilibrium disturbances: Romberg, walking forward and backward, running forward and backward, hopping upon one foot forward and backward, all of which examinations were made with open and with closed eyes.

9.—Goniometer.² Whereby inclination is produced in the four principal directions: forward, backward, right, and left,—with open and with closed eyes. The examinations upon the goniometer were made with the patients barefooted, and in order to prevent slipping, the inclining plank of the goniometer, upon which the pupils stood, was dusted with kolophonium powder. In the table the nomenclature of Kümmel has been adopted: vh = vorn hoch (front high); hh = hinten hoch (back high); rh = rechts hoch (right high); lh = links hoch (left high).

¹ See G. W. Mackenzie concerning the "Galvanic Irritability of the Static Labyrinth." *Archiv für Ohrenheilkunde*, 1908.

² The Alexander modified Stein's goniometer was used in our examinations.

For details see G. W. Mackenzie.¹

10.—Acuity of vision.

11.—Pupillary reaction.

12.—Deep reflexes.

13.—Co-ordination.

All examinations were repeated several times in individual cases where the nature of the examination demanded it; especially so the examinations upon the goniometer.

The results of the complete examinations are summarized in the appended table.

The examination of the caloric irritability of the labyrinth was not made, for with intact membrane the examination with cold water is necessarily a slow process; the examined is frequently nauseated, and, added to this, on account of restlessness and anxiety of the patient, there is the danger of producing, with the cannula, a traumatic rupture of the membrane. In case of dry perforation it appears almost unnecessary to caution against the possibility of the recurrence of middle-ear suppuration in attempting the caloric examination. We were all the more able to exclude this examination since the examination upon the turning stool and the galvanic examination were sufficient to determine the irritability of the static labyrinth.

¹ "Klinische Untersuchungen über die labyrintharen Gleichgewichtsstörungen mit besonderer Berücksichtigung der allgemeinen Prüfungsmethoden und des Goniometers." *Monatschr. f. Ohrenheilk.*, 1908.

TABLE OF HISTORIES AND FINDINGS.

No.	Name.	Age.	History.	Articulation.	Lip Reading.	Capability.	Otoscope Findings.	Tinnitus.	Acoustic Findings.	Vestibular Apparatus.
										Spontaneous Nystagmus.
1.	Victor H.	16½	Deaf since 2d year of life after measles.	1	2	Very good.	Tympanic membranes of both sides completely destroyed. Granulations in tympanic cavities.	Negative.	Complete deafness both sides.	Very slight rotatory nystagmus to both sides when looking extremely to the sides.
2.	Norbert K.	17	Deaf since birth.	3	1	Good.	Both sides normal.	Negative.	Complete deafness both sides.	Slight rotatory nystagmus to both sides when looking extremely to the sides.
3.	Ferdinand K.	13	Greatly impaired hearing since 2d year of life. Cause unknown.	1	1	Very good.	Tympanic membranes retracted and clouded.	Negative.	Hearing greatly diminished, both sides. A ₁ (Bezold) right side much shortened, left side somewhat less shortened.	Rotatory nystagmus to both sides upon looking extremely to the sides.
4.	Anton N.	13½	Deaf since birth.	3	3	Good.	Both sides normal.	Negative.	Reaction to loud tones and noises very weak. A ₁ (Bezold) and small c ₄ both sides very much shortened.	Rotatory nystagmus to both sides upon looking extremely to the sides.
5.	Max B.	13½	Deaf since 2d year of life after blow upon the head.	1	1	Good.	Tympanic membranes of both sides thickened and clouded.	Negative.	Slight rest of hearing in both ears. A ₁ (Bezold) somewhat more shortened in the right than the left ear.	Pronounced rotatory nystagmus to the left when looking to the left, less pronounced rotatory nystagmus to left when looking straight ahead, nystagmus to the right when looking to the right.
6.	Anton R.	15	Deaf since birth.	3	1	Good.	Both sides normal.	Negative.	Complete deafness both sides.	Slight rotatory nystagmus to both sides upon looking to the sides.
7.	Rudolf E.	14	Deaf since birth.	3	2	Very good.	Tympanic membranes of both sides retracted and clouded — shadow on promontory.	Negative.	Complete deafness both sides.	Distinct rotatory nystagmus to both sides when looking to the sides; however, more distinct to the left side.
8.	Konrad K.	11½	Deaf since 5th year of life on account of a fall upon the back of the head.	1	3	Very good.	Both sides normal.	Negative.	Very marked diminution of hearing in right ear, small A ₁ (Bezold) very much shortened. Left ear complete deafness.	Rotatory nystagmus to both sides when looking to the sides; however, more marked to the right side.

TABLE OF HISTORIES AND FINDINGS

VESTIBULAR APPARATUS.		Equilibrium Disturbances.	GONIO-METER.		Vision.	Deep Reflexes.	Pupillary Reaction.	Co-ordination.
Nystagmus after Turning.	Galvanic Reaction.		Eyes open.	Eyes closed.				
Ar 10 turnings to both sides with head bent forward 90°, no nystagmus (reaction) to either side.	R { K 8 Ma rN A 11 Ma rN L { K 8 Ma rN A 8 Ma rN	*R Romberg negative; very broad gait with closed eyes. Hopping with open eyes fair, but with closed eyes very uncertain and pupil tends to fall.	vh 30 hh 28 rh 26 lh 27	vh 27 hh 19 hh 12 lh 11	Good.	Normal.	To light prompt.	No ataxia.
Ar 10 turnings to both sides with head bent forward 90°, no nystagmus (reaction) to either side.	R { K 18 Ma. No re- action. A 18 Ma rN L { K 18 Ma rN A 18 Ma. No re- action.	R Romberg positive; very uncertain and broad gait with closed eyes both when walking forward as well as backward. Hopping barely possible.	vh 28 hh 21 rh 17 lh 21	vh 19 hh 8 hh 4 lh 4	Good.	Normal.	To light prompt.	No ataxia.
Ar 10 turnings to the right with head bent forward 90°, rotatory nystagmus to the right 4 seconds. After ten turnings to the right, with head bent forward 90°, rotatory nystagmus to the left lasting 5 seconds.	R { K 4 Ma rN A 5 Ma rN L { K 3 Ma rN A 5 Ma rN	R Romberg ±; very uncertain and broad gait with closed eyes when walking forward and backward. Hopping very uncertain.	vh 26 hh 30 rh 19 lh 28	vh 12 hh 28 hh 12 lh 18	Good.	Normal.	To light prompt.	No ataxia.
Ar 10 turnings to the right with head bent forward 90°, rotatory nystagmus to the right 16 seconds. After 10 turnings to the right with head bent forward 90°, rotatory nystagmus to the left lasting 16 seconds.	R { K 7 Ma rN A 6 Ma rN L { K 5 Ma rN A 9 Ma rN	R Romberg negative; gait with closed eyes forward and backward more uncertain than with open eyes. Hopping with closed eyes somewhat uncertain.	vh 30 hh 30 rh 30 lh 30	vh 25 hh 28 hh 23 lh 28	Good.	Normal.	To light prompt.	No ataxia.
Ar 10 turnings to both sides with head bent forward 90°, no nystagmus.	Owing to anxiety and the nervousness of the pupil it was not possible to make the examination.	R Romberg ±; uncertain, however not a broad gait with closed eyes when walking forward and backward. Hopping somewhat more uncertain with closed than with open eyes, however not very pronounced.	vh 18 hh 16 rh 19 lh 15	vh 18 hh 15 hh 12 lh 12	Not especially good on account of corneal opacities after keratitis exzematosa.	Normal.	To light prompt.	No ataxia.
Ar 10 turnings to the right with head bent forward 90°, rotatory nystagmus to the right 25 seconds. After 10 turnings to the right with head bent forward 90°, rotatory nystagmus to the left lasting 22 seconds.	R { K 10 Ma rN A 10 Ma rN L { K 19 Ma rN A 11 Ma rN	R Romberg negative; very broad and uncertain gait. Hopping forward and backward with open and closed eyes faultless.	vh 30 hh 30 rh 30 lh 30	vh 23 hh 30 hh 30 lh 30	Good.	Normal.	To light prompt.	No ataxia.
Ar 10 turnings to both sides with head bent forward 90°, no nystagmus.	R { K 14 Ma. No re- action. A 14 Ma. No re- action. L { K 14 Ma. No re- action. A 14 Ma. No re- action.	R Romberg positive; very broad and uncertain gait forward and backward with closed eyes. Also hopping very uncertain.	vh 30 hh 30 rh 30 lh 30	vh 23 hh 17 hh 17 lh 11	Good.	Normal.	To light prompt.	No ataxia.
Ar ten turnings to the right with head bent forward 90°, rotatory nystagmus to the right 15 seconds. After 10 turnings to the right with head bent forward 90°, rotatory nystagmus to the left lasting 15 seconds.	R { K 3 Ma rN A 7 Ma rN L { K 7 Ma rN A 3 Ma rN	R Romberg negative; gait and hopping forward and backward not so certain with closed as with open eyes. However the difference is not very pronounced.	vh 30 hh 30 rh 30 lh 28	vh 25 hh 28 hh 27 lh 27	Good.	Normal.	To light prompt.	No ataxia.

K 8 Ma rN R means Kathode 8 Milliampere rotatory Nystagmus to the Right (or to the Left) and represents the ocular movements with the examiner facing the patient.

TABLE OF HISTORIES AND FINDINGS

No.	Name.	Age.	History.	Articulation.	Lip Reading.	Capability.	Otoscope Findings.	Tinnitus.	Acoustic Findings.	VESTIBULAR APPARATUS.	
										Spontaneous Nystagmus.	
9.	Norbert H.	17	Deaf since birth.	2	1	Good.	Both sides normal.	Noises in left ear only.	Right ear complete deafness. Slight rest of hearing in left ear. Small a_1 (Bezold) and high c_4 very much shortened.	Pronounced rotatory nystagmus to both sides; however more marked to the right side.	
10.	Max L.	14	Deaf since 3d year of life after scarlet fever.	2	1	Very good.	Both sides normal.	Negative.	Complete deafness both sides.	Slight rotatory nystagmus to both sides upon looking extremely to the sides.	
11.	Anton N.	13½	Deaf since birth.	3	3	Good.	Both sides normal.	Negative.	Complete deafness both sides.	Very slight rotatory nystagmus to both sides when looking extremely to the sides.	
12.	Johann O.	13½	Deaf since 1st year of life after meningitis.	4	2	Good.	Both sides normal.	Negative.	Complete deafness both sides.	Slight rotatory nystagmus to both sides when looking extremely to the sides.	
13.	Johann B.	13½	Deaf since 3d year of life after fall(?).	2	2	Sufficient.	Both sides normal.	Negative.	Great impairment of hearing both sides. A_1 (Bezold) and c_4 very much shortened.	Distinct rotatory nystagmus to both sides when looking extremely to the sides.	
	Franz Josef T.	13½	Deaf since 6th year of life. Cause unknown.	1	1	Very good.	Membranes of both sides clouded.	Negative.	Right side slight rest of hearing. A_1 (Bezold) very much shortened. Left side complete deafness.	Very slight rotatory nystagmus to both sides when looking extremely to the sides.	
15.	Helena Z.	14	Deaf since 5th year of life after meningitis.	2	3	Sufficient.	Both sides normal.	Positive left side only.	Both sides slight rest of hearing. A_1 (Bezold) and c_4 very much shortened.	Very slight horizontal nystagmus of long excursion mixed with rotatory nystagmus both sides when looking intently to the sides.	
16.	Hermine N.	15	Deaf since 4th year of age. Cause unknown.	1	2	Good.	Both sides normal.	Positive left side only.	Hearing rests both sides. A_1 (Bezold) and c_4 much shortened.	Very slight rotatory nystagmus both sides when looking extremely to the sides.	

TABLE OF HISTORIES AND FINDINGS

VESTIBULAR APPARATUS.		Equilibrium Disturbances.	GONIO-METER.		Vision.	Deep Reflexes.	Pupillary Reaction.	Co-ordination.
Nystagmus after Turning.	Galvanic Reaction.		Eyes Open.	Eyes Closed.				
er 10 turnings to the with head bent for- rd 90°, rotatory nys- tagmus to the right ing 33 seconds. After turnings to the right h head bent forward , rotatory nystagmus the left lasting 27 onds.	R { K 5 MarN A 2 MarN L { K 2 MarN A 6 MarN	R Romberg negative; gait L and hopping less certain L with closed than with open R eyes. Difference, however, is not pronounced.	vh 30 hh 28 rh 28 lh 28	vh 24 hh 24 rh 22 lh 22	Good.	Normal.	To light prompt.	No ataxia.
er 10 turnings to both es with head bent ward 90°, no nystag- s.	R { K 14 Ma. No re- action. A 14 Ma. No re- action. L { K 14 Ma. No re- action. A 14 Ma. No re- action.	R Romberg positive; very uncertain and very broad gait when walking forward and backward with closed eyes; hopping not pos- sible.	vh 28 hh 30 rh 30 lh 28	vh 22 hh 21 rh 17 lh 15	Good.	Normal.	To light prompt.	No ataxia.
er 10 turnings to the rotatory nystagmus the right lasting 10 onds. After 10 turn- ings to the right with d inclined forward , rotatory nystagmus the left lasting 10 onds.	R { K 18 Ma. No re- action. A 18 Ma. No re- action. L { K 10 MarN A 12 MarN	R Romberg negative; some- what uncertain but not broad gait when walking forward and backward L with closed eyes; hopping uncertain.	vh 30 hh 29 rh 26 lh 28	vh 24 hh 26 rh 21 lh 17	Good.	Normal.	To light prompt.	No ataxia.
er 10 turnings to both es with head bent ward 90°, no nystag- s. (Negative reac- i.)	R { K 5 MarN A 7 MarN L { K 7 MarN A 7 MarN	R Romberg positive; very broad gait and very un- certain when walking for- ward and backward with closed eyes; hopping very uncertain.	vh 27 hh 28 rh 27 lh 26	vh 20 hh 28 rh 22 lh 16	Good.	Normal.	To light prompt.	No ataxia.
er 10 turnings to the with head bent for- rd 90°, rotatory nys- tagmus to the right ing 12 seconds. After turnings to the right h head bent forward , rotatory nystagmus the left lasting 10 sec- s.	R { K 14 Ma. No re- action. A 10 MarN L { K 12 MarN A 12 Ma. No re- action.	R Romberg negative; very broad gait and very un- certain when walking for- ward and backward with closed eyes; hopping very uncertain.	vh 28 hh 28 rh 28 lh 28	vh 22 hh 27 rh 22 lh 27	Good.	Normal.	To light prompt.	No ataxia.
er 10 turnings to the with head bent for- rd 90°, rotatory nys- tagmus to the right last- 26 seconds. After 10 nings to the right with d bent forward 90°, atory nystagmus to left lasting 25 sec- s.	R { K 10 MarN A 10 MarN L { K 10 MarN A 10 MarN	R Romberg negative; gait L and hopping forward and L backward with closed eyes R almost as well as with open eyes.	vh 30 hh 30 rh 30 lh 30	vh 28 hh 29 rh 30 lh 28	Good.	Normal.	To light prompt.	No ataxia.
er 10 turnings to both es with head bent ward 90°, no nystag- s. (Negative reac- i.)	R { K 15 Ma. No re- action. A 11 MarN L { K 4 MarN A 15 Ma. No re- action.	R Romberg negative; uncer- tain and broad gait when walking forward and back- ward; hopping scarcely able.	vh 28 hh 25 rh 25 lh 22	vh 10 hh 17 rh 16 lh 15	Good.	Normal.	To light prompt.	No ataxia.
er 10 turnings to both es with head inclined ward 90°, (Neg. reaction.)	R { K 12 Ma. No re- action. A 12 Ma. No re- action. L { K 12 Ma. No re- action. A 12 Ma. No re- action.	R Romberg positive. Very uncertain and very broad gait when walking forward and backward with closed eyes. Hopping not pos- sible.	vh 24 hh 28 rh 11 lh 24	vh 14 hh 14 rh 8 lh 4	Good.	Normal.	To light prompt.	No ataxia.

TABLE OF HISTORIES AND FINDINGS

No.	Name.	Age.	History.	Articulation.	Lip Reading.	Capability.	Otoscope Findings.	Tinnitus.	Acoustic Findings.	Vestibular Apparatus.
										Spontaneous Nystagmus.
17.	Marie St.	14½	Deaf since 2d year of life through fall from baby carriage.	3	3	Good.	Both sides normal.	Positive left side only.	Right side complete deafness. Left side rest of hearing. A ₁ (Bezold) and C ₄ heard when struck very strong blow with rubber hammer.	Distinct rotatory nystagmus to both sides when looking extremely to the sides.
18.	Olga F.	12½	Deaf since birth	3	2	Good.	Both sides normal.	Negative.	Complete deafness both sides.	Very slight rotatory nystagmus to both sides when looking extremely to the sides.
19.	Karl B.	11½	Deaf since 11th year of age after scarlet fever.	1	2	Good.	Both sides normal.	Negative.	Complete deafness both sides.	Rotatory nystagmus to both sides when looking extremely to the sides.
20.	Aloisia F.	15½	Deaf since 5th year of age after meningitis.	2	1	Good.	Membrane retracted both sides.	Positive left side only.	Complete deafness both sides.	Pronounced horizontal nystagmus to both sides when looking intently to the sides, and slight rotatory nystagmus to the right when looking straight ahead.
21.	Mathilde W.	15½	Deaf since birth.	2	2	Good.	Membrane normal left side, slightly clouded right side.	Positive both sides.	Slight hearing rest both sides. A ₁ (Bezold) and C ₄ very much shortened.	Slight rotatory nystagmus to both sides when looking extremely to the sides.
22.	Olga W. (Sister of No. 21.)	14	Deaf since birth.	3	3	Sufficient.	Both membranes normal.	Positive right side only.	Complete deafness both sides.	Very slight rotatory nystagmus to both sides when looking extremely to the sides.
23.	Marie B.	14½	Deaf since 3d year of life after meningitis.	1	1	Very good.	Both membranes normal.	Positive left side only.	Complete deafness both sides.	Pronounced rotatory nystagmus to the right when looking intently to the right, but no nystagmus to the left when looking to the left.

TABLE OF HISTORIES AND FINDINGS

VESTIBULAR APPARATUS.		Equilibrium Disturbances.	GONIO-METER.		Vision.	Deep Reflexes.	Pupillary Reaction.	Co-ordination.
Nystagmus after Turning.	Galvanic Reaction.		Eyes Open.	Eyes Closed.				
er 10 turnings to left with head bent forward, rotatory nystagmus to the right lasting 11 seconds. After 10 turnings to the right with head bent forward 90°, rotatory nystagmus to the left lasting 17 seconds.	R { K 10 Ma r N A 10 Ma r N L { K 8 Ma r N A 11 Ma r N	R Romberg positive. Gait and hopping forward and backward with closed eyes almost as well as with open eyes.	vh 22 hh 27 rh 28 lh 28	vh 20 hh 26 rh 21 lh 24	Good.	Normal.	To light prompt.	No ataxia.
er 10 turnings to the right with head bent forward 90°, rotatory nystagmus to the left lasting 17 seconds. After 10 turnings to the right with head bent forward, rotatory nystagmus to the left lasting 20 seconds.	R { K 5 Ma r N A 4 Ma r N L { K 4 Ma r N A 5 Ma r N	R Romberg negative. Gait and hopping forward and backward with closed eyes almost as well as with open eyes.	vh 26 hh 29 rh 29 lh 29	vh 18 hh 29 rh 29 lh 29	Good.	Normal.	To light prompt.	No ataxia.
er 10 turnings to the right with head bent forward 90°, rotatory nystagmus to the left lasting 8 seconds.	R { K 3 Ma r N A 3 Ma r N L { K 2 Ma r N A 3 Ma r N	R Romberg negative somewhat broad gait with closed eyes, pupil takes short steps. Hopping with closed eyes tolerably good.	vh 30 hh 30 rh 28 lh 30	vh 25 hh 23 rh 22 lh 22	Good.	Normal.	To light prompt.	No ataxia.
er 10 turnings to the right with head bent forward 90°, rotatory nystagmus to the left lasting 6 seconds. After 10 turnings to the right with head bent forward, no nystagmus, neg. reaction from left eye.	R { K 3 Ma r N A 16 Ma No reaction. L { K 12 Ma No reaction. A 12 Ma No reaction.	R Romberg negative. Very uncertain gait when walking forward and backward with closed eyes. Hopping very uncertain. No dizziness.	vh 13 hh 30 rh 28 lh 30	vh 14 hh 11 rh 21 lh 11	Fair.	Normal.	To light prompt.	
er 10 turnings to the right with head bent forward 90°, rotatory nystagmus to the left lasting 20 seconds. After 10 turnings to the right with head bent forward, rotatory nystagmus to the left lasting 20 seconds.	R { K 10 Ma r N A 5 Ma r N L { K 6 Ma r N A 10 Ma r N	R Romberg negative. Gait and hopping forward and backward with closed eyes as steady as with open eyes.	vh 28 hh 27 rh 28 lh 28	vh 23 hh 27 rh 17 lh 28	Good.	Normal.	To light prompt.	No ataxia.
er 10 turnings to the right with head bent forward 90°, rotatory nystagmus to the left lasting 14 seconds. After 10 turnings to the right with head bent forward 90°, rotatory nystagmus to the left lasting 16 seconds.	R { K 6 Ma r N A 6 Ma r N L { K 8 Ma r N A 6 Ma r N	R Romberg negative. Gait and hopping when walking forward and backward with closed eyes almost as steady as with open eyes.	vh 29 hh 29 rh 28 lh 28	vh 23 hh 28 rh 24 lh 25	Not so good on account of uncorrected high myopia.	Normal.	To light prompt.	No ataxia.
er 10 turnings to both sides with head bent forward 90°, no nystagmus. (Neg. reaction.)	R { K 14 Ma. No reaction. A 14 Ma. No reaction. L { K 14 Ma. No reaction. A 14 Ma. No reaction.	R Romberg negative. Uncertain gait when walking forward and backward (with short steps) with closed eyes. Hopping very poor.	vh 29 hh 27 rh 26 lh 17	vh 22 hh 22 rh 14 lh 18	Left eye not so good on account of abducens paralysis, etc. Right eye vision good.	Normal.	To light prompt.	No ataxia.

TABLE OF HISTORIES AND FINDINGS

No.	Name.	Age.	History.	Articulation.	Lip Reading.	Capability.	Otoscope Findings.	Tinnitus.	Acoustic Findings.	VESTIBULAR APPARATUS.	
										Spontaneous Nystagmus.	
24.	Marie G.	15	Deaf since 3d year of life after a fall.	1	1	Sufficient.	Both membranes normal.	Positive right side only.	Right side slight hearing rest present, C ₄ very short. Left side complete deafness.	Slight rotatory nystagmus to both sides when looking extremely to the sides.	
25.	Aleisia S.	14	Deaf since birth.	4	1	Very good.	Both membranes normal.	Positive both sides.	Slight hearing rest both sides, small a ₁ (Bezold) not heard upon either side, c ₄ very short.	Rotatory nystagmus to both sides when looking extremely to the sides.	
26.	Emilie S. (Sister to No. 25.)	12	Deaf since birth.	3	2	Sufficient.	Double-sided chronic adhesive process with retracted membranes.	Negative.	Complete deafness both sides.	Rotatory nystagmus to both sides when looking extremely to the sides.	
27.	Angela W.	13½	Deaf since 6th year of age after measles.	1	1	Very good.	Membrane both sides completely destroyed.	Positive left side only.	Complete deafness both sides.	Slight rotatory nystagmus to both sides when looking extremely to the sides.	
28.	Alfred S.	23	Deaf since 20th year after scarlet fever.	1	1	Very good.	Membranes both sides retracted and clouded.	Positive both sides.	Complete deafness both sides.	Marked rotatory nystagmus to both sides upon looking extremely to the sides.	
29.	Leopoldine K.	9	Deaf since July, 1907, after meningitis.	1	3	Very good.	Membrane left side normal, right side slightly clouded.	Positive both sides.	Complete deafness both sides.	Slight rotatory nystagmus to both sides when looking extremely to the sides.	
30.	Ferdinand L.	10	Hard of hearing since birth.	1	1	Good.	Membrane both sides retracted and clouded.	Negative.	Slight rest of hearing both sides, a ₁ and c ₄ much shortened.	Very slight rotatory nystagmus to both sides when looking extreme to the sides.	
31.	Wilhelm W.	11 J.	Deaf after whooping-cough in 8th year.	3	3	Sufficient.	Membrane right side somewhat clouded with chalk deposits. Left membrane clouded and retracted.	Negative.	Left side slight rest of hearing, small a ₁ and c ₄ very much shortened. Right side completely deaf.	Rotatory nystagmus to both sides looking extremely to the side. More pronounced to the right than the left.	

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VESTIBULAR APPARATUS.		Equilibrium Disturbances.	GONIO-METER.		Vision.	Deep Reflexes.	Pupillary Reaction.	Co-ordination.
Nystagmus after Turning.	Galvanic Reaction.		Eyes Open.	Eyes Closed.				
ter 10 turnings to both es with head bent for- rd 90°, no nystag- s. (Negative reac- n.)	R { K 4 MarN A 12 MarN L { K 8 MarN A 4 MarN	R Romberg positive; gait L and hopping with closed L eye both forward and R backward very uncertain with falling to the sides.	vh 23 vh 22 hh 28 hh 22 rh 23 rh 14 lh 24 lh 18		Good.	Normal.	To light prompt.	No ataxia.
ter 10 turnings to the t with head bent for- rd 90°, rotatory nys- mus to the right ting 16 seconds. After turnings to the right h head bent forward , rotatory nystagmus the left lasting 4 sec- s.	R { K 1 MarN A 4 MarN L { K 3 MarN A 1 MarN	R Romberg negative; gait L and hopping with closed L eyes somewhat uncertain. R with tendency to fall lat- erally.	vh 27 vh 22 hh 14 hh 12 rh 16 rh 16 lh 19 lh 9		Good.	Normal.	To light prompt.	No ataxia.
ter 10 turnings to the t with head bent for- rd 90°, rotatory nys- mus to the right ting 6 seconds. After turnings to the right h head bent forward , rotatory nystagmus the left lasting 4 sec- s.	R { K 2 MarN A 2 MarN L { K 3 MarN A 2 MarN	R Romberg positive; gait L when walking forward L and backward very un- R steady and broad with closed eyes; hopping scarcely possible.	vh 21 vh 18 hh 22 hh 15 rh 15 rh 8 lh 21 lh 17		Good.	Normal.	To light prompt.	No ataxia.
ter 10 turnings to the t with head bent for- rd 90°, rotatory nys- mus to the right last- ing 17 seconds. After 10 nings to the right h head bent for- rd 90°, rotatory nys- mus to the left last- ing 14 seconds.	R { K 10 MarN A 7 MarN L { K 7 MarN A 10 MarN	R Romberg negative; gait L and hopping forward and L backward with closed eyes R almost as well as with open eyes.	vh 29 vh 24 hh 30 hh 30 rh 24 rh 19 lh 30 lh 28		Good.	Normal.	To light prompt.	No ataxia.
ter 10 turnings to both es with head bent for- rd 90°, no nystag- s. (Negative reac- n.)	R { K 7 MarN A 10 MarN L { K 7 MarN A 7 MarN	R Romberg positive; gait L forward and backward L very unsteady and broad R with closed eyes; hop- ping scarcely possible.	vh 26 vh 17 hh 29 hh 13 rh 26 rh 10 lh 30 lh 11		Both sides diminished on account of recent keratitis interstitialis luetica he- reditaria.	Normal.	To light prompt.	No ataxia.
ter 10 turnings to both es with head bent for- rd 90°, no nystag- s. (Negative reac- n.)	R { K 12 Ma. No re- action. A 12 Ma. No re- action. L { K 12 Ma. No re- action. A 12 Ma. No re- action.	R Romberg positive; gait L with closed eyes very un- certain; hopping almost or quite impossible with closed eyes.	vh 21 vh 12 hh 23 hh 12 rh 15 rh 7 lh 20 lh 9		Good.	Normal.	To light prompt.	No ataxia.
ter 10 turnings to the t with head bent for- rd 90°, rotatory nys- mus to the right last- ing 16 seconds. After 10 nings to the right with d bent forward 90°, atory nystagmus to left lasting 22 sec- s.	R { K 4 MarN A 3 MarN L { K 2 MarN A 4 MarN	R Romberg negative; gait L and hopping forward and L backward with closed eyes R almost as well as with open eyes.	vh 27 vh 22 hh 30 hh 26 rh 26 rh 19 lh 27 lh 21		Good.	Normal.	To light prompt.	No ataxia.
ter 10 turnings to both es with head bent for- rd 90°, no nystag- s.	R { K 10 Ma. No re- action. A 8 Ma. L { K 10 Ma. No re- action. A 10 Ma. No re- action.	R Romberg positive; gait L forward and backward L with closed eyes very un- certain and broad; hop- ping barely possible.	vh 25 vh 13 hh 27 hh 10 rh 16 rh 10 lh 24 lh 10		Good.	Normal.	Prompt.	No ataxia.

TABLE OF HISTORIES AND FINDINGS

No.	Name.	Age.	History.	Articulation.	Lip Reading.	Capability.	Otoscope Findings.	Tinnitus.	Acoustic Findings.	VESTIBULAR APPARATUS.	
										Spontaneous Nystagmus.	
32.	Adolf K.	13½	Deafness since birth the result of forceps delivery.	2	2	Sufficient.	Both membranes retracted and clouded.	Negative.	Left side slight rest of hearing. A ₁ and c ₄ shortened. Right side completely deaf.	Horizontal nystagmus to both sides upon looking to the extreme sides.	
33.	Heinr. Baron M.	12	Deaf since birth. (Parents also deaf.)	3	3	Sufficient.	Both sides normal.	Negative.	Left side slight rest of hearing. A ₁ not heard and c ₄ only by strongest irritation. Right side completely deaf.	Slight rotatory nystagmus to both sides upon looking to the extreme sides.	
34.	Aloisia St.	14½	Deaf since birth.	4	2	Very good.	Membrane both sides clouded.	Positive upon left side.	Complete deafness both sides.	Slight rotatory nystagmus to both sides upon looking to the extreme sides.	
35.	Fredericke F.	12	Deaf since birth.	3	2	Good.	Both sides normal.	Negative.	Complete deafness both sides.	No nystagmus to either side upon looking to the extreme sides.	
36.	Stephanie P.	12½	Deaf after meningitis in 2d year. (Syndactylie of left extremity.)	2	1	Very good.	Tympanic membrane both sides clouded.	Negative.	Complete deafness both sides.	No nystagmus to either side when looking intently to the sides.	
37.	Josefine P.	13	Deaf in 2d year after teething and convulsions.	2	1	Sufficient.	Tympanic membrane both sides retracted and clouded.	Positive both sides.	Slight rest of hearing both sides. A ₁ (Bezold) and c ₄ shortened.	Very slight rotatory nystagmus to both sides when looking extremely to the sides.	
38.	Theresia W.	13½	Deaf after convulsions in first year.	2	2	Sufficient.	Both membranes clouded.	Positive left side only.	Left side slight rest of hearing. A ₁ and c ₄ shortened. Right side complete deafness.	Marked rotatory nystagmus to the right when looking to the right less to the left when looking to the left.	

TABLE OF HISTORIES AND FINDINGS

VESTIBULAR APPARATUS.		Equilibrium Disturbances.	GONIO-METER.		Vision.	Deep Reflexes.	Pupillary Reaction.	Co-ordination.
Nystagmus, after Turning.	Galvanic Reaction.		Eyes Open.	Eyes Closed.				
After 10 turnings to the left with head inclined forward 90°, rotatory nystagmus to the right lasting 14 seconds. After 10 turnings to the right with head inclined forward 90°, rotatory nystagmus to the left lasting 15 seconds.	R } K 4 MarN A 3 MarN L } K 3 MarN A 5 MarN	R Romberg negative; gait forward and backward with closed eyes somewhat uncertain; hopping somewhat uncertain.	vh 26 hh 25 rh 30 lh 25	vh 17 hh 18 rh 17 lh 15	Good.	Normal.	Prompt.	No ataxia.
After 10 turnings to the left with head bent forward 90°, rotatory nystagmus to the right lasting 16 seconds. After 10 turnings to the right with head bent forward 90°, rotatory nystagmus to the left lasting 15 seconds.	R } K 4 MarN A 4 MarN L } K 4 MarN A 4 MarN	R Romberg negative; gait and hopping somewhat more uncertain with closed eyes than with open eyes. (This child was rather clumsy.)	vh 22 hh 25 rh 26 lh 25	vh 11 hh 27 rh 22 lh 10	Good.	Normal.	Prompt.	No ataxia.
After 10 turnings to the left with head inclined forward 90°, rotatory nystagmus to the right lasting 16 seconds. After 10 turnings to the right with head bent forward 90°, rotatory nystagmus to the left lasting 19 seconds.	R } (K 5 MarN A 12 Ma. No re- action.) L } (K 12 Ma. No re- action.) A 4 MarN	R Romberg negative; somewhat more uncertain in gait and hopping with closed than with open eyes. (This child like the preceding child was normally clumsy.)	vh 21 hh 30 rh 30 lh 27	vh 18 hh 30 rh 16 lh 15	Good.	Normal.	Prompt.	No ataxia.
After 10 turnings to the left with head inclined forward 90°, rotatory nystagmus to the right lasting 21 seconds. After 10 turnings to the right with head inclined forward 90°, rotatory nystagmus to the left lasting 20 seconds.	R } K 4 MarN A 10 MarN L } K 10 MarN A 6 MarN	R Romberg negative; gait and hopping more uncertain with closed than with open eyes; gait, however, was not broad.	vh 25 hh 30 rh 30 lh 30	vh 19 hh 29 rh 27 lh 29	Good.	Normal.	Prompt.	No ataxia.
After 10 turnings to both sides with head inclined forward 90°, no nystagmus. (Negative reaction.)	R } (K 12 Ma. No re- action.) A 12 Ma. No re- action.) L } (K 12 Ma. No re- action.) A 12 Ma. No re- action.)	R Romberg ±; very uncertain and broad gait when walking forward and backward with closed eyes; hopping impossible with closed eyes.	vh 30 hh 30 rh 26 lh 30	vh 19 hh 21 rh 14 lh 17	Good.	Normal.	Prompt.	No ataxia.
After 10 turnings to the left with head inclined forward 90°, rotatory nystagmus to the right lasting 17 seconds. After 10 turnings to the right with head inclined forward 90°, rotatory nystagmus to the left lasting 20 seconds.	R } K 8 MarN A 2 MarN L } K 2 MarN A 6 MarN	R Romberg negative; gait and hopping with closed eyes somewhat more uncertain with closed than with open eyes.	vh 15 hh 22 rh 23 lh 19	vh 16 hh 22 rh 14 lh 16	Right eye vision poor on account of macula cornea and convergence. Right eye. Left eye (fixing eye) vision good.	Normal.	Prompt.	No ataxia.
After 10 turnings to the left with head inclined forward 90°, rotatory nystagmus to the right lasting 12 seconds. After 10 turnings to the right with head inclined forward 90°, rotatory nystagmus to the left lasting 13 seconds.	R } K 6 MarN A 8 MarN L } K 6 MarN A 10 MarN	R Romberg negative; swaying when walking forward and backward with closed eyes; but gait is not broad; hopping with closed eyes rather poor.	vh 18 hh 21 rh 24 lh 19	vh 16 hh 22 rh 14 lh 14	Good.	Normal.	Prompt.	Patient is somewhat clumsy but no ataxia.

TABLE OF HISTORIES AND FINDINGS

No.	Name.	Age.	History.	Articulation.	Lip Reading.	Capability.	Otoscope Findings.	Tinnitus.	Acoustic Findings.	Vestibular Apparatus.
										Spontaneous Nystagmus.
39.	Aloisa L.	10½	Hardness of hearing; cause and time of occurrence not ascertainable.	1	1	Good.	Both membranes slightly retracted.	Negative.	Slight rest of hearing both sides. A ₁ and c ₄ very much shortened.	Rotatory nystagmus to both sides when looking extremely to the sides.
40.	Franz L. (Brother to No. 39.)	18	Deaf since birth.	2	1	Good.	Both membranes normal.	Negative.	Slight rests of hearing both sides. A ₁ and c ₄ shortened more on right than left side.	Slight rotatory nystagmus to both sides when looking extremely to the sides.
41.	Christine G.	10	Deaf since birth.	2	1	Good.	Both membranes clouded.	Negative.	Complete deafness both sides.	Pronounced rotatory nystagmus to both sides when looking extremely to the sides.
42.	Philomene F.	10	Deaf after measles in 2d year.	1	1	Good.	Both membranes retracted and promontory shows red.	Positive right side only.	Slight rest of hearing both sides. A ₁ (Bezold) very short, c ₄ not heard.	No nystagmus to either side when looking extremely to the sides.
43.	Marie P.	12	Deaf after measles in 4th year.	1	1	Good.	Otitis med. sup. chron. dextra, with total destruction of the membrane; left side atresia of the meatus, post operative.	Positive, very slight left side.	Hears only very loudest tones. A ₁ and c ₄ shortened.	Horizontal and rotatory nystagmus to both sides when looking to the sides.
44.	Margaret W.	9½	Deaf after meningitis, time not ascertainable.	1	1	Very good.	Normal.	Negative.	Slightest rest of hearing. A ₁ (Bezold) very short, c ₄ not heard.	Rotatory nystagmus to both sides when looking to the sides.
45.	Mano G.	22	Deaf after meningitis in 12th year.	1	1	Very good.	Normal.	Positive both sides; stronger upon left side.	Complete deafness both sides.	Slight rotatory nystagmus to both sides when looking extremely to the sides.
46.	Eduard U.	16	Deaf after typhoid fever in 3rd year.	5	3	Very good.	Both sides normal.	Negative.	Complete deafness both sides.	Very slight rotatory nystagmus to both sides when looking to the sides.

TABLE OF HISTORIES AND FINDINGS

VESTIBULAR APPARATUS		Equilibrium Disturbances.	GONIO-METER		Vision.	Deep Reflexes.	Pupillary Reaction.	Co-ordination.
Nystagmus after Turning.	Galvanic Reaction.		Eyes Open.	Eyes Closed.				
After 10 turnings to the left with head inclined forward 90°, rotatory nystagmus to the right lasting 15 seconds. After 10 turnings to the right with head inclined forward 90°, rotatory nystagmus to the left lasting 15 seconds.	R { K 6 MarN A 4 MarN L { K 4 MarN A 6 MarN	R Romberg negative. Gait slightly broad and somewhat uncertain when walking backward. Hopping not so bad.	vh 28 hh 28 rh 26 lh 28	vh 15 hh 28 rh 11 lh 16	Good.	Normal.	Prompt.	No ataxia.
After 10 turnings to the left with head inclined forward 90°, rotatory nystagmus to the right lasting 24 seconds. After 10 turnings to the right with head inclined forward 90°, rotatory nystagmus to the left lasting 22 seconds.	R { K 5 MarN A 8 MarN L { K 8 MarN A 4 MarN	R Romberg negative. Gait and hopping with closed eyes quite as good as with open eyes.	vh 29 hh 28 rh 29 lh 29	vh 24 hh 26 rh 29 lh 23	Good.	Normal.	Prompt.	No ataxia.
After 10 turnings to the left with head inclined forward 90°, rotatory nystagmus to the right lasting 11 seconds. After 10 turnings to the right with head inclined forward 90°, rotatory nystagmus to the left lasting 9 seconds.	R { K 4 MarN A 4 MarN L { K 4 MarN A 4 MarN	R Romberg negative. Gait and hopping forward and backward with closed eyes quite as good as with open eyes.	vh 28 hh 28 rh 26 lh 23	vh 11 hh 27 rh 24 lh 13	Good.	Normal.	Prompt.	No ataxia.
After 10 turnings to the left with head inclined forward, rotatory nystagmus to the right lasting 9 seconds. After 10 turnings to the right with head inclined 90° forward, rotatory nystagmus to the left lasting 9 seconds.	R { K 6 MarN A 6 MarN L { K 6 MarN A 4 MarN	R Romberg negative. Gait forward and backward with closed eyes almost as good as with open eyes. Hopping the same.	vh 27 hh 27 rh 27 lh 28	vh 27 hh 26 rh 26 lh 28	Right eye blind with ant. synechia and bulb atrophic, strabismus converg. Left eye normal.	Normal.	Prompt in left eye.	Patient somewhat clumsy; however, no distinct ataxia.
After 10 turnings to the left with head inclined forward 90°, rotatory nystagmus to the right lasting 19 seconds. After 10 turnings to the right with head inclined forward 90°, rotatory nystagmus to the left lasting 9 seconds.	R { K 6 MarN A 4 MarN L { K 4 MarN A 6 MarN	R Romberg positive. Gait forward and backward with closed eyes broad and with short steps. Hopping somewhat uncertain.	vh 25 hh 22 rh 22 lh 23	vh 23 hh 25 rh 20 lh 23	Good.	Normal.	Prompt.	No ataxia.
After 10 turnings to both sides with head inclined forward 90°, no nystagmus. (Neg. reaction.)	R { K 12 Ma. No re- action. A 12 Ma. No re- action. L { K 12 Ma. No re- action. A 12 Ma. No re- action.	R Romberg positive. Gait forward and backward with closed eyes very uncertain and broad. Hopping impossible with closed eyes.	vh 19 hh 22 rh 17 lh 17	vh 14 hh 13 rh 7 lh 7	Good.	Normal.	Prompt.	Patient clumsy but no ataxia.
After 10 turnings to both sides with head inclined forward 90°, no nystagmus. (Negative reaction.)	R { K 10 MarN A 12 MarN L { K 12 MarN A 6 MarN	R Romberg ±. Gait forward and backward with closed eyes very uncertain and broad. Hopping very poor with closed eyes.	vh 30 hh 29 rh 30 lh 23	vh 15 hh 11 rh 8 lh 9	Vision fair in spite of slight secondary atrophy of both papillae.	Normal.	Right pupil does not react so promptly as left.	No ataxia.
After 10 turnings to both sides with head bent forward 90°, no nystagmus.	R { K 12 Ma. No re- action. A 12 Ma. No re- action. L { K 12 Ma. No re- action. A 12 Ma. No re- action.	R Romberg negative. Gait when walking forward and backward with closed eyes uncertain and swaying. Hopping impossible.	vh 30 hh 30 rh 30 lh 30	vh 16 hh 14 rh 7 lh 7	Good.	Normal.	Prompt.	Patient somewhat clumsy; however, no distinct ataxia.

TABLE OF HISTORIES AND FINDINGS

No.	Name.	Age.	History.	Articulation.	Lip Reading.	Capability.	Otoscope Findings.	Tinnitus.	Acoustic Findings.	Vestibular Apparatus.
										Spontaneous Nystagmus.
47.	Georg Sp.	11	Deaf of unknown origin and time.	5	5	Good.	Right side membrane slightly retracted and atrophic. Left side normal.	Negative.	Slight rests of hearing both sides. A ₁ (Bezold) shortened, c ₄ not heard.	Slight rotatory nystagmus to both sides when looking to the sides.
48.	Alfred E.	11	Deaf since birth.	2	2	Sufficient.	Both sides normal.	Negative.	Slight rests of hearing present both sides. C ₄ not heard and a ₁ (Bezold) much shortened.	Rotatory nystagmus to both sides when looking to the sides; however more marked to the right.
49.	Leonhardus A.	11	Deaf in 1st year from a fall.	1	1	Very good.	Both sides normal.	Negative.	Slight rests of hearing both sides. A ₁ (Bezold) and c ₄ shortened.	No rotatory nystagmus to both sides when looking to the sides.
50	Gustav S.	10	Deaf since 5th year after a fever of long duration.	2	1	Sufficient.	Both sides normal.	Negative.	Complete deafness both sides.	Rotatory nystagmus to right side when looking to right, no nystagmus to left side.
51.	Franz L.	10	Deaf since 8th year from a fall on the back of the head.	1	3		Both membranes slightly retracted and clouded.	Negative.	Complete deafness both sides.	Slight rotatory nystagmus to both sides when looking to the sides.

TABLE OF HISTORIES AND FINDINGS

VESTIBULAR APPARATUS.		Equilibrium Disturbances.	GONIO-METER.		Vision.	Deep Reflexes.	Pupillary Reaction.	Co-ordination.
Nystagmus after Turning.	Galvanic Reaction.		Eyes Open.	Eyes Closed.				
After 10 turnings to the left with head bent forward 90°, rotatory nystagmus to the right lasting 20 seconds. After 10 turnings to the right with head bent forward 90°, rotatory nystagmus to the left lasting 18 seconds.	R { K 8 Mar N A 12 Mar N L { K 12 Mar N A 8 Mar N	R Romberg negative; gait and hopping forward and backward with closed eyes somewhat more uncertain than with open eyes.	vh 26 hh 30 rh 28 lh 27	vh 19 hh 25 rh 13 lh 19	Good.	Normal.	Prompt.	No ataxia.
After 10 turnings to both sides with head bent forward 90°, no nystagmus.	R { K 12 Ma. No reaction. A 12 Ma. No reaction. L { K 12 Ma. No reaction. A 12 Ma. No reaction.	Romberg positive; gait forward and backward with closed eyes very uncertain, swaying and broad; hopping hardly possible.	vh 27 hh 30 rh 26 lh 27	vh 17 hh 21 rh 5 lh 10	Good (recent conjunctivitis eczematosa), 1st attack.	Normal.	Prompt.	No ataxia.
After 10 turnings to the left with the head bent forward 90°, rotatory nystagmus to the right lasting 8 seconds. After 10 turnings to the right with head bent forward 90°, rotatory nystagmus to the left lasting 9 seconds.	R { K 10 Ma. No reaction. A 10 Ma. No reaction. L { K 10 Ma. No reaction. A 10 Ma. No reaction.	Romberg negative; gait and hopping forward and backward with closed eyes almost as well as with open eyes.	vh 26 hh 30 rh 29 lh 29	vh 28 hh 28 rh 27 lh 25	Good.	Normal.	Prompt.	No ataxia.
After 10 turnings to both sides with head bent forward 90°, no nystagmus.	R { K 12 Ma. No reaction. A 12 Ma. No reaction. L { K 12 Ma. No reaction. A 12 Ma. No reaction.	Romberg ±; gait forward and backward with closed eyes uncertain and broad; hopping hardly possible.	vh 27 hh 30 rh 28 lh 22	vh 21 hh 19 rh 14 lh 9	Good.	Normal.	Prompt.	No ataxia.
After 10 turnings to both sides with head bent forward 90°, no nystagmus.	R { K 10 Ma. No reaction. A 10 Ma. No reaction. L { K 10 Ma. No reaction. A 10 Ma. No reaction.	Romberg positive; gait with closed eyes forward and backward swaying and broad, hopping impossible.	vh 25 hh 28 rh 22 lh 25	vh 6 hh 11 rh 3 lh 5	Good.	Normal.	Prompt.	No ataxia.

RESULTS.

The **Cause** of the deafness.—Of the 51 deaf-mutes examined, 49 are at the present time pupils of the k. k. Deaf-Mute Institute in Wien. Two, Alfred Slawik (No. 28) and Mano Graf (No. 45), are graduates of the same institution. The 49 examined pupils proved to be apt subjects for examination, while a great number of less intelligent pupils were not drawn upon.

The histories showed the cause of deafness to be as follows:

Congenital deafness: 18 cases (Nos. 2, 4, 6, 7, 9, 11, 18, 21, 22, 25, 26, 30, 32, 33, 34, 35, 41, 48).

Acquired deafness: 33 cases, which include meningitis 8 cases (Nos. 12, 15, 20, 23, 29, 36, 44, 45). To these may be added 2 cases (Nos. 37 and 38) which, though the ascribed cause of deafness was teething and convulsions, etiologically may be better classified under that of meningitis.

Injury (fall upon the head in early childhood): 7 cases (Nos. 5, 8, 13, 17, 24, 49, 51).

Measles: 4 cases (Nos. 1, 27, 42, 43).

Scarlet-fever: 3 cases (Nos. 10, 19, 28).

Whooping-cough: 1 case (No. 31).

Typhoid: 1 case (No. 46).

Cause of deafness unknown: five cases (Nos. 3, 14, 16, 39, 47).

According to the age at which appearance of deafness occurred the histories show:

Occurrence of deafness in	1st year,	4 cases	(Nos. 12, 38, 42, 49).
" " " "	2d " "	6 " "	1, 3, 5, 17, 36, 37).
" " " "	3d " "	5 " "	10, 13, 23, 24, 46).
" " " "	4th " "	2 " "	16, 43).
" " " "	5th " "	4 " "	8, 15, 20, 50).
" " " "	6th " "	2 " "	14, 27).
" " " "	8th " "	3 " "	29, 31, 51).
" " " "	11th " "	1 case	(No. 19).
" " " "	12th " "	1 " "	45).
" " " "	20th " "	1 " "	28).

The histories appear unreliable in the following cases:

Case 5 (deafness occurring in the 2d year through a fall upon the head) is probably a meningitis-deafness; likewise Cases 17 and 49. Therefore, the above classification should be so revised as to include under meningitis-deafness 13 cases, leaving but 4 cases of traumatic deafness.

In reference to the **articulation**, one is impressed with the fact that the males, as well as the females, with acquired deafness, articulated much better than those with congenital deafness. In all, 19 pupils showed articulation 1 = very good; of these, 10 were males and 9 were females. The 10 male pupils include 9 cases of acquired and 1 case of congenital deafness; the 9 female pupils include 8 cases of acquired and 1 case of congenital deafness. It was demonstrated, though long known, that the articulation was better the later the deafness was acquired. From these figures we further recognize the importance of hearing for the learning of articulation. A child who had heard at all after birth (even though the deafness appeared in the earliest years of life) learns to articulate much better than though the child had been deaf from birth.

On the contrary, it appears that rests of hearing are of no special benefit for the articulation.

Among 19 of the best pupils, 12 showed hearing rests, while 7 were totally deaf.

The possible association of proficiency of articulation to deafness through meningitis is shown by the following:

Among the 10 cases of meningitis-deafness, four showed under articulation progress 1, five showed progress 2, and one showed progress 4.

Since in cases of meningitis-deafness, remaining pathologic changes in the brain are quite possible, it is not surprising if they articulate poorly. This is not, however, the case. From the articulation, we are unable to obtain any proof that in cases of deafness after meningitis any special cortical changes remain. We shall refer to this

point later when we come to the discussion of labyrinthine equilibrium disturbances.

Under **capability** (general mental development) as furnished by the teachers of the institute, 17 pupils are rated "very good," 19 "good," and 12 "sufficient." These figures are of value to us. There was not one among them whose intelligence was not sufficient to permit of a satisfactory examination.

Otoscopic findings: In 26 cases the tympanic membrane was normal. In only three cases was there a double-sided chronic middle-ear suppuration with perforation or complete destruction of the membrane. The remaining cases showed changes in the form of clouding, retraction, or other catarrhal changes of the membrane.

Tinnitus or subjective noises in one or both sides were present in 20 cases; total deafness, 20 cases; hearing rests, 27 cases. Of the cases with hearing rests 9 were of congenital and 18 of acquired deafness; of the totally deaf, 10 were of congenital and 14 of acquired deafness.

Among the cases with subjective noises were 11 with hearing rests (Nos. 9, 15, 16, 17, 21, 24, 25, 37, 38, 42, and 43), and 9 totally deaf (Nos. 20, 22, 23, 27, 28, 29, 35, 45, and 51). It is of interest to note that among these totally deaf, who complain of subjective noises, we should find two of congenital deafness (Nos. 22 and 35).¹

Static labyrinth: Of the 51 examined pupils, 21 showed double-sided absolute non-irritability of the static labyrinth, although only 4 of these showed no form of spontaneous nystagmus even in extreme lateral position of the eyeballs. Of the remaining 17 cases of double-sided labyrinth destruction, we were unable to accept the spontaneous nystagmus as labyrinthine. Evidently in this case the nystagmus was produced by the unusual strain upon the eye muscles (in the extreme lateral position). This fact forces upon our attention the neces-

¹ See Alice V. Mackenzie: "Zur Klinik der galvanischen Akustikusreaktion." *Wiener klin. Wochenschr.*, März, 1908.

sity of differentiation of labyrinthine nystagmus from all other forms of nystagmus in our examination of cases without deafness.

As stated above, 21 cases showed absolute non-irritability of the static labyrinth (**no reaction after turning; with great diminution of, or negative, galvanic reaction**). While 21 cases showed complete destruction of static labyrinth, 24 showed complete destruction of acoustic labyrinth. A comparison of these figures shows that the acoustic apparatus and its nerve is somewhat more sensitive to noxious influences than the static labyrinth and its nerve; however, the difference is not great. From the results of former investigations, we expected to find a much greater difference.

Wanner (1902) found, first, that deaf-mutes who show no nystagmus after turning, at the same time show no equilibrium disturbance (Schwanken); on the contrary, those who show nystagmus after turning, at the same time show positive equilibrium disturbance. The cases of the first group comprise those of destruction; while cases of the second group comprise those of more or less intact vestibular apparatus. Wanner found in his material (108 deaf-mute pupils) no nystagmus after turning in 34.7%, a figure which agrees approximately with ours. Bezold (1898) found in his examinations 28.8%. Denker, who limited his examinations to those with complete deafness, found 42.9% showing no nystagmus after turning. That Denker's figures should exceed those of Bezold, Wanner, and ours, is readily explained when we recall that he (Denker) included in his examinations cases only of complete deafness, while the other authors included pupils with hearing rests and those without (totally deaf).

Eight cases (Nos. 6, 19, 22, 26, 27, 34, 35, 41) showed **complete deafness** with remaining (of course, not normal) **irritability of the static labyrinth**. Six cases (Nos. 5, 15, 24, 31, 44, 48) showed **hearing rests** with **negative irritability of the labyrinth** and, too, all these cases

showed positive equilibrium disturbances. Fourteen cases (Nos. 1, 2, 7, 10, 12, 18, 23, 28, 29, 36, 45, 50, 51) showed **complete deafness** and **absolute non-irritability** of the **static labyrinth**, all of which cases showed in addition most pronounced equilibrium disturbances. Among these 14 cases, 5 were deafness after meningitis, 3 were congenital deafness, 1 was deafness after trauma, 2 were deafness after scarlet-fever, 1 after measles, 1 after long-continued fever (probably meningitis), and finally 1 after typhoid fever. We have been able to group the congenital and acquired form of deafness, according to the reactions, into the following:

TABLE I.

	Total Number.	Congenital Deafness.	Acquired Deafness.
I.—Total deafness with negative reactivity of the static labyrinth . . .	15	3	12
II.—Hearing rests with positive reactivity of the static labyrinth . . .	20	7	13
III.—Total deafness with positive reactivity of the static labyrinth . . .	9	7	2
IV.—Hearing rests with negative reactivity of the static labyrinth . . .	7	1	6
Total	51	18	33

According to the above table, the figures prove that the great majority of cases show similar changes in both functions; in form I., where both acoustic and static labyrinth were completely destroyed, and in form II., where both acoustic and static labyrinth showed rests of functions. In the two forms, I. and II., it is found that the congenital and acquired cases were affected with about the same average frequency, when we consider the relative proportion of congenital to acquired deafness in our material; that is, as 18 congenital is to 33 acquired. In

form III. (complete deafness with positive irritability of the static labyrinth) the congenitally-deaf outnumber the acquired.

This corroborates the results obtained by Alexander and Kreidl, from which we may conclude that form III. represents a type of anatomical changes found in animals with congenital labyrinth anomalies (degenerative atrophy of the pars inferior labyrinthi).¹

It is interesting to note that in form IV. we find the vast majority to be cases of acquired deafness. This group further illustrates the circumscribed labyrinth affections; that is, complete non-irritability of the static labyrinth with rests of functions in the acoustic labyrinth, a well recognized *post-embryonal* process. This fact, contrary to the opinion of Herzog,² deserves to be emphasized.

Galvanic reaction: We found 21 cases with negative reactibility of the static labyrinth showing positive equilibrium disturbance. Most of these required a current of from 8-10 milliamperes to produce a positive reaction, while the remaining 30 cases with more intact static labyrinths showed typical reactions with a current of from 4-8 milliamperes, corresponding in its intensity of reaction to that obtained by turning upon the turning stool.

Equilibrium disturbance was pronounced in all 15 cases with complete non-reactibility of the static and acoustic labyrinth. This was also pronounced in the 7 cases with negative reactibility of the static labyrinth with hearing rests (group IV.). Somewhat less pronounced equilibrium disturbances were found in 10 other cases where the static labyrinth showed positive though diminished reactions to turning and to the galvanic current. Little or no disturbance of equilibrium was found in the remaining 21 cases, in which the reactibility of the static

¹ This fact has also been verified by Hammerschlag (*Z. f. O.*, Bd. 50).

² *Labyrinththeilung und Gehör*, München, 1908.

labyrinth to turning and the galvanic current proved normal.

Regarding equilibrium disturbances, the Alexander modified goniometer proved a more accurate apparatus for the detection of equilibrium disturbances than any of the other methods. It goes without saying that the figures contained in the large table¹ represent the average obtained and in almost every case verified by repeated examinations. In cases of labyrinthine disease and also frequently in normal people, there occur, with inclination of the goniometer, swaying movements, in spite of which, however, the patient is able to retain equilibrium. In these cases the swaying of the patient is mostly temporary and disappears with higher elevation of the goniometer. This condition was also found in a number of our deaf-mutes with remaining reactivity of the static labyrinth.

With a considerable number of pupils this swaying was entirely absent; the examined pupils, with less degree of elevation and without previous swaying, apparently lost their equilibrium completely, and threatened to fall. With these pupils a pronounced reaction appeared also when the inclined goniometer was lowered to the horizontal plane, whereby the pupil again threatened to fall. *A further fact worth noting, is that none of these pupils complained of any form of vertigo; accordingly, we cannot believe the equilibrium disturbances in these cases were dependent upon the semicircular canals, and yet we have here well recognized equilibrium disturbances of vestibular origin² (macula utriculi, macula sacculi). Furthermore, all of these cases showed absolute non-reactibility of the static labyrinth.*

Vision was more or less impaired in 7 cases (Nos. 5, 20, 22, 23, 28, 37, and 42). See Table II.

¹ S. Monatschr. f. Ohrenheilk., 1908.

² See G. W. Mackenzie, Arch. f. Ohrenheilk., 1908.

TABLE II.

Case No.	Eye Findings.	Equilibrium.	Reactivity of the Static Labyrinth.
5	maculæ corneæ	disturbed	negative.
20	vision diminished	disturbed	left side negative, right side positive.
22	uncorrected high myopia	undisturbed	positive.
23	left-sided abducens paralysis	disturbed	negative.
28	double-sided corneal opacities after keratitis interstit. (lues hereditaria)	disturbed	negative.
37	maculæ corneæ et strabismus convergens oc. dex.	slightly disturbed	positive.
42	atrophic bulbus O.D.	undisturbed	positive.

According to the above table, of 7 cases with impaired vision, we find: four cases with pronounced disturbances of equilibrium, one with slight disturbance of equilibrium, and two with normal equilibrium. The labyrinthine character of these equilibrium disturbances (excepting Case 37) and their independence of vision are recognized when one considers, in the above table, the reactivity of the static labyrinth. In the Cases 22 and 42 no equilibrium disturbances were present. Both of these showed positive reactivity of the static labyrinth. In Cases 5, 20, 23, and 28, the disturbances of equilibrium corresponded to the non-reactivity of the static labyrinth. In one case only (No. 37) was slight equilibrium disturbance found with positive reactivity of the static labyrinth. In this case we must conclude that the strabismus and macula corneæ were etiologically contributing factors of the equilibrium disturbance. At all events this case proves, in our examinations for labyrinthine equilibrium disturbances, the necessity of including a careful examination of the eyes.

Pupillary reaction: Pupillary reaction was absent in case No. 42 because of blindness and anterior synechia in

an atrophic eyeball. In one case (Slavik) the pupillary reaction was diminished upon one side (keratitis interstitialis from lues hereditaria). In the remaining cases the pupils were round and the reactions were prompt and normal.

Co-ordination: In five cases marked awkwardness or clumsiness was shown; however, without demonstrable ataxia. These five cases were all cases of acquired deafness, of which two (Nos. 20 and 44) were deafness after meningitis; one case (No. 38) after convulsions (probably meningitis); one case (No. 42) after measles; one case (No. 46) after typhoid fever. Considering that in the remaining 11 cases of deafness after meningitis there existed no clumsiness, we can see no reason why the clumsiness in cases Nos. 20 and 24, as well as in the remaining cases, is in any way characteristic for meningitis or the cortical changes following meningitis. In Case 42 there existed in spite of the clumsiness no equilibrium disturbances, in the remaining four cases equilibrium disturbances were present; however, not more marked than in the great number of cases of equilibrium disturbances *without* clumsiness. It may be said that in the four cases (Nos. 20, 44, 38, and 46) the clumsiness contributed to, but in no way was the cause of, the equilibrium disturbances.

SUMMARY.

It is shown, from our material, that the static labyrinth is somewhat more resistant to deleterious influences than the acoustic labyrinth (cochlea); however, the difference is not so great as had been expected from previous anatomical examinations, especially in cases of malformation. The remarkable findings of degenerative atrophy of the pars inferior labyrinthi (most characteristic anatomical findings in congenital deafness) are herewith explained, that the pars superior, philogenetically a much older part, is relatively more resistant to intra-embryonal-appearing pathologic changes (arrest of

formation) than the philogenetically young cochlea. That this applies in cases of congenital deafness had also been demonstrated in the material examined by us, and the findings, complete deafness with remaining irritability of the static labyrinth (form III., see page 508), show that of the nine cases seven were cases of congenital deafness.

On the other hand, the results of our examination show that there is no essential difference between the static and acoustic labyrinth in their powers of resistance to *post-embryonal* pathologic influences. In these 51 cases before us, isolated destructive processes occurred but slightly more frequent in the acoustic apparatus (cochlea, nerve, and ganglion spirale) than in the static labyrinth (sacculus, utriculus, semicircular canals, vestibular nerve, and its ganglion). It may be observed, however, that these figures possibly do not correspond exactly with the results that might be obtained from an examination of the total number of pupils in the deaf-mute institute. On the other hand, cases of isolated lesions of the static labyrinth with more or less reacting acoustic labyrinth—that is, with good hearing—are not to be found in deaf-mute institutes. These latter are to be observed rather in the clinics, where they come to seek relief from their vertigo and equilibrium disturbances.

If we summarize all cases with inner-ear symptoms (deafness, vertigo, and equilibrium disturbances), we find a slight majority of affections of the acoustic labyrinth over those of the static labyrinth. Since the relationship of turning vertigo (*Drehschwindel*) to the organ of hearing has been recognized, these patients seek the ear clinics more frequently than formerly. A very instructive case of this kind, which we also had opportunity of examining, is a case recently reported by Neumann: a patient, previously in good health, was taken suddenly with a very heavy attack of (*Drehschwindel*) vertigo and nystagmus to the sound side. The examination revealed, further, evidences of neuritis of the tri-

geminus with herpes zoster; so that we must accept the case to be one of isolated neuritis of the nervus vestibularis, since the nervus cochlearis was intact and hearing normal. Similar cases have been reported by Frankl-Hochwart and still another case by Neumann.¹

In many of the cases of complete destruction of the acoustic and static labyrinth or of the nervus octavus the equilibrium disturbances were very pronounced, all of which showed more or less positive Romberg (the most uncertain of all tests for disturbances of equilibrium); while, on the contrary, none of them had vertigo or gave the history of vertigo. The non-reactibility of the semicircular canals, arrived at by rapid and long-continued turning (10 to 20 times) upon the turning stool, failed to produce, no matter in what position the head was held, either nystagmus or vertigo. We desire to lay special stress upon this finding, since it demonstrates that the late labyrinthine equilibrium disturbance is not, as has been generally accepted, an accompanying or resulting phenomenon of vertigo and nystagmus.

The methods adopted for the examination of equilibrium disturbances in these cases consisted in the performance of straight-line movements in the three directions of space (walking, running, hopping), and the examination upon the goniometer, all of which were made with both open and closed eyes. In all of these methods of examination (straight-line movements), irritation or examination of the semicircular canals is excluded.

We are enabled here to express the opinion that in the above cases the equilibrium disturbances are due to the failure of impulses having reached (which normally are carried to) the end organ in the vestibular apparatus (macula sacculi and macula utriculi). This opinion, unproven up to the time of our examinations, is supported by the fact that in our series of clinically and anatomically

¹ To be sure, also cases of isolated neuritis of the nervus cochlearis have been observed (Kaufmann and Hammerschlag).

(Alexander) examined cases, the degree of equilibrium disturbances was in direct proportion to the amount of destructive processes in the vestibule.

This leads us to a clinical confirmation of Breuer's theory: that the sacculus and utriculus together represent the nerve end organ for perception of motion acceleration in straight lines.

The impulses proceeding from the two nerve endings serve for the maintenance of equilibrium of the body and head in the three principal directions of space. This opinion has received, from a clinical standpoint, substantial support by clinical examinations made by G. W. Mackenzie. When the vestibular apparatus is destroyed, there occurs disturbance of equilibrium, which manifests itself upon active and passive movements in the three directions of space. An exact answer to the question of the function of the nerve endings in the vestibular sacs is possible only by experimental means. Up to the present time, however, we have not succeeded in producing, in mammals, isolated experimental changes in the vestibular sacs, preventing, at the same time, changes in the semicircular canals.

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ON THE STRUCTURE AND FUNCTION OF THE EPITHELIUM IN THE SULCUS SPIRALIS EXTERNUS.

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(*With eight figures on Appended Plates A, B, C, D, and E.*)

INTRODUCTION

THE outer wall of the ductus cochlearis is divided by the prominentia spiralis into two unequal concave segments. The larger segment lies above the prominentia spiralis and is occupied by the stria vascularis. The smaller segment lies below the prominentia spiralis and is known as the sulcus spiralis externus.

The epithelium covering the outer end of the membrana basilaris is composed of tall cylindrical cells called the cells of Claudius. These cells extend beyond the attachment of the basilar membrane, over on the crista of the ligamentum spirale, and in this way cover in part the sulcus externus.

The epithelium covering the prominentia spiralis is made up of a single layer of low cuboidal cells. These cells are continuous above with the epithelium of the stria vascularis. They extend downward well into the sulcus externus, and in the labyrinth of the pig consist, as a rule, of from six to eight rows.

Continuous with the epithelium covering the prominentia spiralis and covered over in part at times by the cells of Claudius is a group of epithelial cells which occupy

the deepest part of the sulcus externus. They possess certain marked peculiarities which distinguish them from epithelium found elsewhere in the labyrinth. These cells have been observed by Deiters and studied by Boettcher, Gottstein, and Katz, and later by Prenant and Retzius. The peculiar feature of this epithelium as described by these writers was the presence of long finger-like processes from the cells, extending out into the connective tissue of the ligamentum spirale.

As regards the function of these cells, Gottstein was at first inclined to look on them as a type of neuro-epithelium, but was unable to establish any connection with nerve fibres.

Boettcher believed they had contractile properties, and attributed to them the important function of accommodation in the ear by putting the basilar membrane on tension.

Katz was inclined to agree with Boettcher in the contractile nature of these cells.

Prenant accepted the theory that these cells represented muscular tissue derived from epithelium.

Retzius did not believe that any evidence had been produced that would justify the conclusion that these cells are contractile.

The latter investigator succeeded in staining these cells by the Golgi method in the mouse five to eight days old and in the foetus of the cat. He gives the following careful description of their structure.¹

Diese letzteren Zellen dringen tief in das unterliegende Gewebe hinein; die Endäste dieser Fortsätze dringen hier und da fast durch die bindegewebige Wand bis zur Nähe ihrer Aussenfläche. . . . Die Zellen, deren oberes Ende in der oberen Fläche des Epithels steht und dem oberen Ende gewöhnliches Cylinderzellen entspricht, radiiren von hier aus nach aus-

¹ "Über das Epithel des Sulcus Spiralis Cochleae." *Biologische Untersuchungen*, Neue Folge v., 1893.

senunten, nach aussen und nach aussenoben; Fortsätze, die sich in verschiedener Weise verzweigen und sich hier und da kreuzen, dringen tief in das Bindegewebe hinein. Ein Anastomosiren der Zellen-Fortsätze unter sich, das Prenant also möglich erwähnt, sah ich nicht; noch weniger habe ich von dem von den Autoren angenommenen Zusammenhang dieser Zellen, resp. Zellen Fortsätze mit den umgebenden Bindegewebszellen jemals eine Spur angetroffen.

Der Kern dieser eigenthümlichen Zellen liegt in der Regel unter der unteren Grenze der gewöhnlichen Epithelzellen des unteren Sulcustheils; man findet ihn gewöhnlich in einer spindelförmigen Erweiterung des Zellen-Körpers, die tief in dem Bindegewebe liegt. (P. 39.)

AUTHOR'S INVESTIGATION.

My attention was first directed to the peculiarities of the epithelium in the sulcus externus while examining sections of the labyrinth of the adult guinea-pig which had been stained by the Mallory reticulum stain. It was often noted that in sections stained by this method a group of epithelial cells occupying the bottom of the sulcus externus would be sharply differentiated from the neighboring cells. The cells thus differentiated not only sent long finger-like processes into the spiral ligament, but there was an actual invasion by the cells themselves of this structure. The picture presented by these sections was such a striking one (see Fig. 1) that I was led to undertake a closer investigation regarding the development, the exact character, and especially the functional significance of these cells.

The material used in this work was for the most part the labyrinth of the domestic pig.

In the ear of the pig these cells first began to differentiate from the remainder of the epithelium in this region in the embryo measuring about 12cm long. At this age protoplasmic processes from the single layer of cells lining the sulcus began to perforate, in the basal coil, the strong basement membrane separating these cells

from the spiral ligament. In the pig embryo 15cm long, such processes had formed from these cells throughout the coils of the cochlea and in the basal coil the bunching up of the cells began to appear preliminary to the actual invasion by the cells themselves of the spiral ligament.

In studying the labyrinth of the new-born pig and the foetus at full term, which may be looked upon as representing the adult condition, the following characteristics of this epithelium were noted.

In the first place, the cells in the sulcus externus, as regards staining properties both of the cell protoplasm and the nuclei, resemble closely the epithelium covering the prominentia spiralis and are sharply differentiated from the cells of Claudius, which latter take, on the whole, a much fainter stain.

In the second place, the epithelial cells of the sulcus externus as they penetrate the spiral ligament are always the more clearly differentiated from the surrounding structure the closer they lie to the free surface of the sulcus. This demarcation is often accentuated by a slight cleavage between these cells and the connective tissue of the spiral ligament, due to a slight shrinking in the process of preparation. On the other hand, the deeper these cells penetrate into the spiral ligament the more difficult it becomes often to distinguish them from the neighboring structure.

The depth to which the nuclei of these cells penetrate the spiral ligament often extends to fully midway between the sulcus externus and bony capsule. The fibrillar processes which are apparently continuous with the deeper ends of these cells extend usually to the loose reticulum of cells bordering the bony capsule. The processes usually run outward and upward. A bundle of these processes, shown in Fig. 3, ran parallel to the stria vascularis up to the attachment of the membrane of Reissner.

In the third place, it was observed that these epithelia

cells which invade the spiral ligament do not form a continuous band around the coils of the cochlea, but appear in clumps. Between these clumps the epithelium lining the sulcus externus presents a single layer of cuboidal cells quite like the epithelium covering the *prominentia spiralis*. It was also noted that a depression was usually found on the free surface of the sulcus externus, marking the point at which such a clump of epithelial cells penetrates the spiral ligament. These characteristics are especially clearly shown in sections cut parallel to the long axis of the coil. See Fig. 4.

Finally, I observed that often where sections were made so as to cut across an epithelial clump at right angles to its long axis, a small clearly-defined central lumen could be made out. This tubule was usually so small that sections cut parallel to the long axis of the epithelial clump usually missed it completely or else cut it obliquely so that its presence was easily overlooked. Examples of sections cut in this way, showing the epithelial clumps but no tubules, are shown in Figs. 1 and 2. It is evident that sections such as these must be the usual ones, and it is this formation that has been observed and described by previous writers.

After the presence of tubules in these epithelial clumps became known to me, I had no difficulty in finding a large number of sections in which they could be made out. To find sections, however, in which such tubules could be traced to the free surface of the sulcus externus was no easy task, since to cut the tubule parallel to its long axis was largely a matter of chance. Among the many hundred sections I have cut and stained since I first reported the finding of these tubules,¹ I have a few which show the tubule throughout a large part of its course. Several of these I have had drawn, see Figs. 3, 6, 8.

This tubule is sometimes found dilated. In Fig. 5

¹ "Proceedings of the Association of American Anatomists," *American Journal of Anatomy*, vol. v., No. 2, p. vii., 1905.

is shown a preparation where this dilated tubule has been cut across in such a way that the cement lines (Schliessleisten) marking the cell-boundaries on the free surface of the tubule are shown. It sometimes happened that the tubule underwent a marked cyst-like enlargement, just as one might expect in case secretion was retained by an occlusion of the tubule. Such a cystic enlargement is well shown in Fig. 7.

As regards the function of these peculiar epithelial clumps in the sulcus externus, I was convinced early in my study of the cells that the theory that this was a contractile structure for the purpose of exerting tension on the membrana basilaris was untenable. The reason was that, while these cell-processes were found scattered along the entire length of the ductus cochlearis from the beginning of the basal coil to the upper coil near the apex of the cochlea, it was for only a very short area in the basal coil that the position and direction of these cell-processes were such that their contraction could possibly exert tension on the basilar membrane.

That the cells have an important physiological function there can be no doubt. In my earlier studies of the blood-supply of the labyrinth,¹ I had been impressed with the elaborate system of blood-vessels for supplying the ligamentum spirale, and especially with the wonderfully rich capillary supply to just this part of the ligament into which these cells penetrate. It seemed improbable that a structure having a purely passive supporting function, such as is usually attributed to the spiral ligament, should require the rich capillary supply which had here been provided. At that time I attempted in vain to surmise what the significance of this rich blood-supply was, what important function resided in this part of the ligamentum spirale which called for this

¹"The Distribution of Blood-vessels in the Labyrinth of the Ear of *Sus Scrofa Domestica*." *The Decennial Publications*, University of Chicago, University of Chicago Press, 1903.

extensive capillary supply. The suggestion has sometimes been made that the varying degree of tension of the radiating fibres of the membrana basilaris, which seems to be necessary if we accept the teaching of Helmholtz that these fibres act as resonator, was dependent on the filling of these blood-vessels in the spiral ligament. It does not seem probable, however, that nature would be forced to resort to this indirect method of accomplishing an end so easily reached in other ways. I might add, furthermore, that in a recent study of the membrana basilaris I believe I have been able to demonstrate that this structure cannot act as a vibrating mechanism, but that it is merely a passive supporting apparatus.¹

With the discovery that these epithelial clumps growing out from the sulcus externus into the spiral ligament are provided with tubules which open on the free surface, the question of the function of these cells becomes quite clear. Such tubules can have but one significance, that of a secreting mechanism. We have here in the sulcus externus epithelial prolongations each provided with a central lumen—in other words, a type of secreting or glandular epithelium. Whether these glands secrete all of the constituents of the endolymph or only a part, we have no means of knowing. It seems probable, however, that the stria vascularis may share in the function of secreting the endolymph.

EXPLANATION OF PLATES.

Terms Common to All the Figures.

- S s e = Sulcus spiralis externus.
- P s = Prominentia spiralis.
- C C = Cells of Claudius.
- S v = Stria vascularis.
- L s = Ligamentum spirale.

The figures are all drawn with the assistance of the Leitz Obj.
 $\frac{1}{12}$ Immers.

¹"A Restudy of the Minute Anatomy of Structures in the Cochlea, with Conclusions Bearing on the Solution of the Problem of Tone Perception." *The American Journal of Anatomy*, vol. vii., No. 2, pp. 245-257, Aug., 1907.



Fig. 1.

Fig. 2.

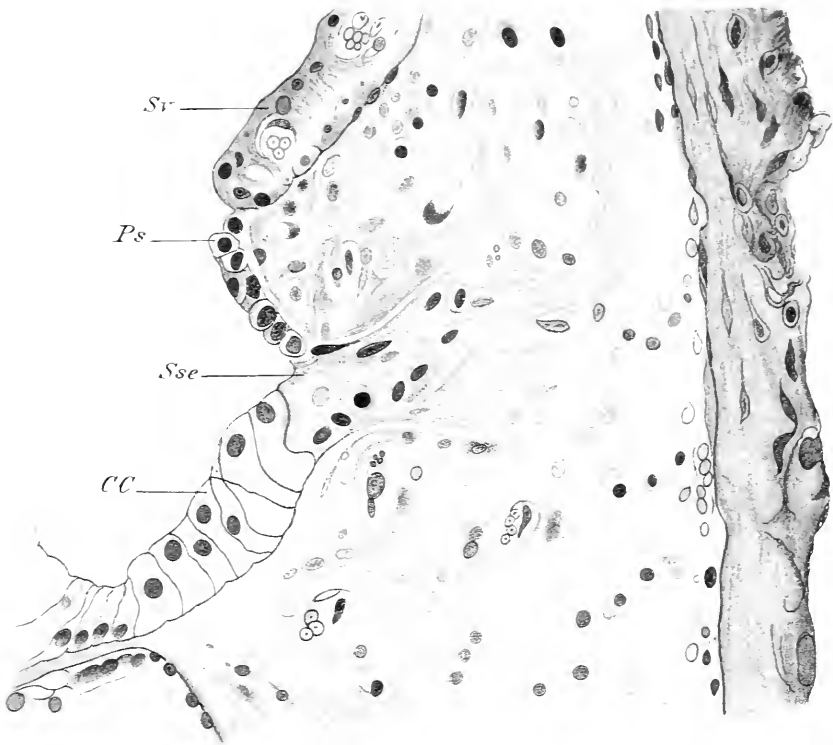
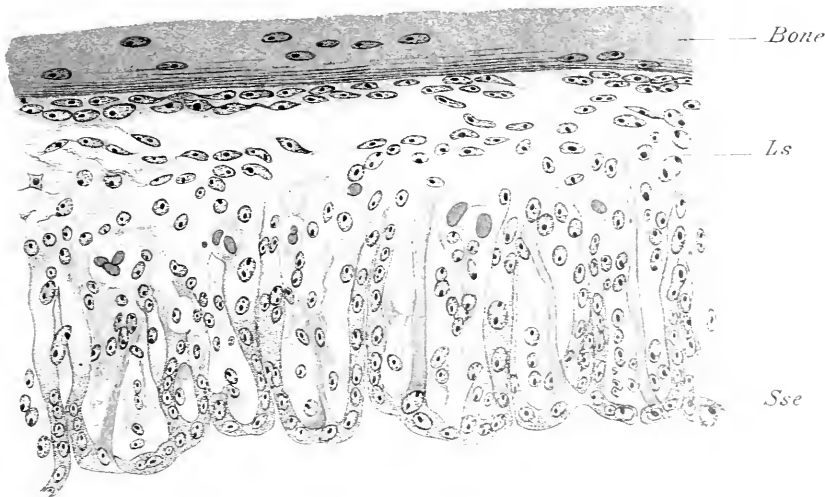


Fig. 4.



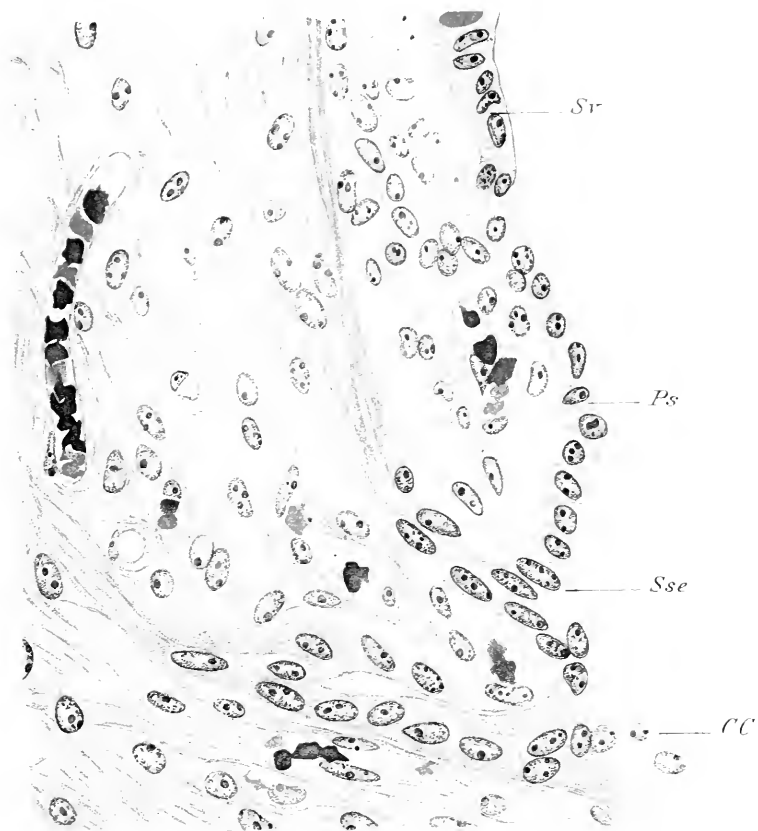


Fig. 5.

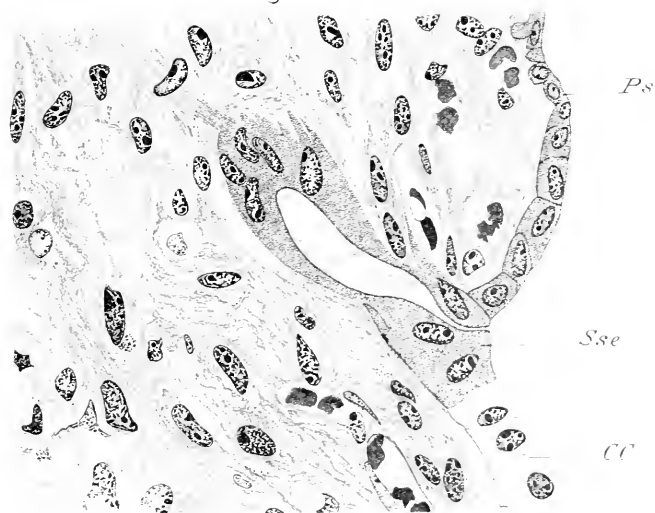


Fig. 6.

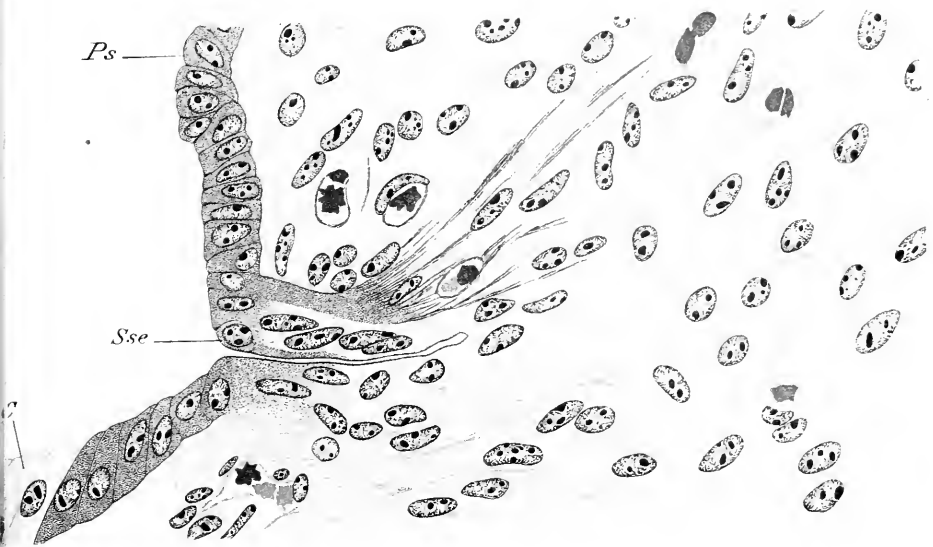


Fig. 7.

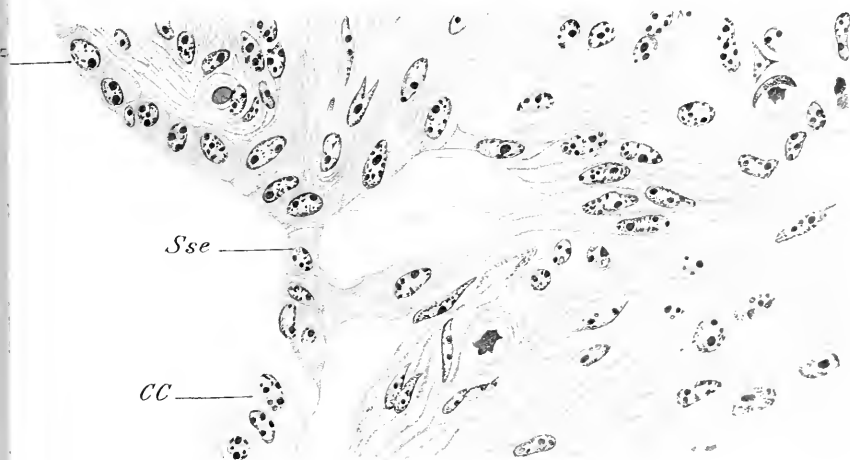


Fig. 8.



FIG. 1.

Preparation from the labyrinth of an adult guinea-pig, fixed in Zenker's solution, embedded in paraffin, and cut five micra thick. The section has been stained with the Mallory reticulum stain. This preparation shows a clearly defined clump of epithelium from the sulcus externus penetrating deeply the spiral ligament and sending out long finger-like processes which extend to the loose reticulum of cells bordering the bony capsule.

FIG. 2.

Preparation from the labyrinth of the new-born domestic pig, showing the epithelium of the sulcus externus growing out into the spiral ligament. A slight cleavage separates these epithelial cells from the surrounding structure.

FIG. 3.

Section of the outer wall of the ductus cochlearis from the labyrinth of a new-born domestic pig. Several clumps of epithelium from the sulcus externus have grown out into the spiral ligament. The lower clump is cut so as to show the central lumen throughout a large part of its course. The upper clump is not cut so as to show its tubule. Long fibrillar processes extend from this clump of cells parallel with the stria vascularis up as far as to the attachment of the membrane of Reissner.

FIG. 4.

Section cut parallel to the long axis of the basal coil of the cochlea and passing directly through the sulcus externus. Successive clumps of epithelium growing out from the sulcus externus into the spiral ligament are shown. In several of these the central lumen has been cut across. The preparation is from the foetus of a domestic pig 18cm long.

FIG. 5.

Preparation from the labyrinth of a new-born domestic pig, fixed in Zenker's solution, embedded in celloidin, cut 10 micra thick, and stained with neutro-gentian. This section is cut through the centre of a dilated tubule which occupies the middle of a clump of epithelium growing out from the sulcus externus into the spiral ligament. The cement lines (Schliessleisten) marking the cell boundaries in the free surface of the tubule are clearly defined.

FIG. 6.

Section from the labyrinth of a new-born domestic pig, cut close to the beginning of the basal coil. A tubule in a clump of epithelium from the sulcus externus is shown throughout a large part of its extent and opening on the free surface.

FIG. 7.

Section from the labyrinth of a new-born domestic pig, showing a cystic dilatation of the tubule in a clump of epithelium from the sulcus externus. The cell boundaries on the free surface of the tubule are shown.

FIG. 8.

Preparation from the labyrinth of a new-born domestic pig. Section shows an extensive invasion of the spiral ligament by the epithelium occupying the sulcus externus. The section chanced to cut through the central lumen of an epithelial clump throughout a large part of its course.

ARTERIAL HEMORRHAGE FROM THE AUDITORY
MEATUS IN A CHILD, AFTER A BRIEF AT-
TACK OF OTITIS MEDIA ACUTA FOLLOWING
TONSILLITIS WITH TONSILLAR ABSCESS.
LIGATION OF THE COMMON CAROTID: UN-
EVENTFUL RECOVERY.

By DR. J. A. SPALDING, PORTLAND, ME.

CASES of abundant and alarming arterial hemorrhage from the auditory meatus, calling for ligation of the common carotid, in chronic otitis suppurativa are so rare that each one should be carefully reported. Even more urgent is this need when the operation is called for under similar hemorrhages following cases of otitis acuta in children. The case which I now report comes under the latter category, and deserves brief mention as an addition to the small list of similar cases hitherto recorded.

During the service of Dr. W. B. Moulton at the Maine General Hospital in 1907, a patient was brought in with the following history.

A boy of five years of age three weeks before entering the hospital had suffered from an attack of tonsillitis followed rapidly with a tonsillary abscess on the right side of the throat. After this had spontaneously discharged a large amount of pus, otitis acuta set in on the same side. The boy had never before had any discharge from either ear and his hearing in both ears, so far as the parents had observed, had always been perfect. After a day of considerable pain in the ear the *Mt* perforated and gave issue to a large amount of steadily-flowing serous discharge, but not tinged with

blood. This continued until four days before the child was brought to the hospital. Here then we have about sixteen days in all, for the tonsillitis, the abscess, the otitis, and the serous discharge.

On the seventeenth day without previous warning there was a sharp arterial hemorrhage from the right meatus, and so abundant that a physician was sent for. He plugged the meatus with the result that blood flowed from the nose and mouth whilst considerable ran off into the stomach. The bleeding ceased when the child fainted from loss of blood. On three successive days similar hemorrhages occurred with abundant loss of blood. On the fourth day the child was admitted into the hospital.

Condition.—Very pale, delicate in appearance. Hæmoglobin 40. Extreme pallor of the entire body. Considerable swelling over the tip of the mastoid and extending down into the neck below the ear.

Consultation being at once held it was decided to postpone ligation of the common carotid owing to the dangers implied by the operation, and to try farther plugging of the meatus with adrenalin and to inject chloride of calcium hypodermatically. This was faithfully carried out, but a fresh and abundant arterial hemorrhage from the meatus the next morning made ligation of the common carotid seem imperative at every risk.

Before the operation was performed by Dr. John F. Thompson, then on surgical duty at the hospital, the following points in the child's condition were noted. Right pupil contracted to pin-head size; left pupil greatly dilated. Patient apparently comatose from loss of blood. Temperature 102°. Pulse difficult to count but thought to be about 170. Respiration very slow and hardly perceptible. After etherizing, the common carotid was tied in the usual manner and the mastoid opened and carefully cleansed of some small amount of pus and considerable debris, by Dr. Moulton.

The patient improved the moment that the operation was finished; the pupils became of equal size, the pulse rapidly normal, and temperature also fell to normal. The child made an absolutely uneventful recovery; the mastoid dressings were changed once or twice and in a fortnight the

patient passed from under observation. There has been no recurrence since.

Owing to the extreme rarity of such cases a few remarks on the literature may not come amiss.

Milligan (*Practitioner's Handbook of Diseases of the Ear*, sixth edition, p. 350) says that ulceration in the bone in otitis suppurativa chronica may extend into the carotid. Almost instantaneous death has been recorded, but generally three or four abundant hemorrhages precede the fatal one. The common carotid has been ligated, but owing to recurrence of hemorrhage ligation of both common carotids has been done. If the hemorrhage diminishes by carotid pressure the vessel must be ligated, but if it does not diminish then the bleeding is venous and may be arrested by plugging.

Politzer (*Handbook of Diseases of the Ear*, Am. Ed., 1901, p. 504) says this accident is of the greatest rarity and mentions instances from the practice of Kessler and Sutphen. His own personal case was in a tuberculous man and the autopsy showed erosion of the carotid in the carotid canal where the vessel curves from vertical to horizontal position. Baizeau and Choyau's cases are also mentioned, as well as an instance of such hemorrhage with an intact *Mt*, the hemorrhage flowing into the pharynx. Tuberculosis, syphilis, and scrofula are suggested as causes of the carotid erosion and in one instance the bleeding followed a chemical injury. The bleeding may last for a few minutes or oozing may continue for several hours. A patient who refused to permit ligation died after recurrent hemorrhage in eleven days. Politzer mentions Billroth's case which will be mentioned below, and suggests that in hospital cases a nurse should be on hand to apply compression to the carotid, and to try the effect of hemostatics, on which, however, he places little reliance.

The most careful study of hemorrhages from the

auditory meatus has been made by Spencer (*Med. Chi. Trans.*, 1901, lxxiv., p. 373), who goes over the whole ground so far reported and adds a new case of his own. His paper, greatly condensed, shows that there are three classes of patients in whom hemorrhage has been observed: the tuberculous with long-standing otorrhœa, the healthy with otitis suppurativa chronica, and children with otitis acuta. His list includes twenty cases and to these he adds one. The present case would make the number *twenty-two* so far recorded in accessible literature.

His earliest case is from Toynbee. He also quotes from Schwartze and Politzer. Death in one instance resulted from a furious hemorrhage, a sequestrum putting the carotid into free communication with the large cavity. A tuberculous patient had long suffered with suppurative otitis and the discharge had often been tinged with blood. Another patient had a violent fit of tuberculous coughing which was followed by hemorrhage ultimately fatal. All of the tuberculous patients died, some despite ligation of the carotid.

Spencer's *second class* contains those occurring in otitis suppurativa chronica, concerning which he says that owing to better treatment of the cause now prevailing, hemorrhages are likely to become more rare. Most of these seem to have been fatal; though ligation was not employed in any except in one of Billroth's in which ligation of both common carotids was performed because ligation of one alone did not check recurrence of the hemorrhage. His *third class* contains a list of six cases of otitis acuta in two of which death followed hemorrhages occurring very rapidly after the onset of otitis acuta but in which ligation was not done at all. Finally he adds four cases in which ligation was done and in all of which recovery took place. The youngest child was three years old, the oldest eleven. The time between the onset of the otitis and the hemorrhage varied from ten days to two months.

The discussion following Spencer's paper showed the rarity of the occurrence and defended the propriety of ligating the common carotid despite the dangers of the operation advanced by some members. There was also a general consensus of opinion that, if the patient recovered, the less any attempt was made to treat the local conditions of the ear, afterwards, the less the chance of instituting meddlesome surgery. Ligation of the internal carotid was regarded as superfluous; besides the operation on the common carotid lies farther away from any source of infection, and the operation is easier. Regarding the risks of ligating the artery in children, Spencer says that after studying a long list of such operations on children for other causes than the hemorrhage which he has just described, he could not find any great percentage of mortality. The operation of ligating the common carotid is, however, not to be undertaken lightly, because an examination of statistics for all diseases in adults and in children shows an average mortality, when done for wounds, of 54% ; when done for exophthalmos, of 7% ; and for all possible varieties of disease and injuries the recorded mortality as I find between 1900 and 1906 was 21% .

These remarks contain notices, in brief, of all the instances of hemorrhage from the auditory meatus which I have, personally, been able to discover in my accessible literature. It would be well worth while if some of our younger students in otology in the larger centres were to investigate this topic, since the appearance of Spencer's paper in 1901.

TWO CASES OF SINUS THROMBOSIS, WITH ATYPICAL SYMPTOMS. OPERATIVE AND PATHOLOGICAL FINDINGS.¹

BY S. J. KOPETZKY, M.D., NEW YORK CITY.

CASE 1.—C. W., aged 43, appeared at the Manhattan Eye and Ear Hospital on October 8, 1907, giving a history of having a discharging ear, which had persisted for one year, having been caused by a severe cold. The examination shows a perforation of large size, marginally situated, through which a moderate amount of purulent discharge came away. The patient was put upon rational cleansing treatment and seemed to improve as time went on. On March 20th, he appeared at the Clinic with a swelling over the mastoid process of the left side, stating that this swelling had appeared two days previously. He had no pain and no fever and had passed a comfortable night. The swelling extended well over the temporal and parietal regions and forward as far as the outer angle of the eye. The external auditory canal showed oedematous infiltrate.

Believing that I was dealing with an acute exacerbation of chronic otitis media, I suggested operation and immediately sent him to the ward for preparation, and within a half hour the operation was performed.

Status on Admission: Temperature 100.2°, R. 20, P. 80.

Operative Findings.—The usual post-auricular incision demonstrated no pus from the swollen oedematous tissue over the mastoid process. This was the first intimation that I had that I might be dealing with some sinus trouble, as previous observation on sinus cases had shown this finding

¹ Read before the Section on Otology, N. Y. Academy of Medicine, October 9, 1908.

in sinus involvement. (*Annals of Otology*, March, 1908.) The removal of the cortex showed the mastoid apophysis filled with fluid pus. The cortex overlying the antrum was rather thick. The mastoid cells extended backward and upward rather unusually far and were found filled with necrotic debris and pus. The sinus took a course rather forward and almost bisected in a diagonal direction the mastoid process, cells being evident both above and below it. The sinus wall was covered with necrotic granulations and its exposure for considerable distance failed to show a healthy wall. The sinus was then opened at the level of the antrum and found to contain a dark firm clot. The sinus was now traced backwards toward the torcular for about an inch and a half, being opened all along its route, and free bleeding was obtained about $1\frac{1}{2}$ inches back from the knee. Working downward toward the bulb the central end of the clot was not reachable, therefore after temporarily packing the cavity, resterilizing our hands and instruments, the neck was prepared for resection of the jugular.

The operation on the jugular was easily performed, the internal jugular resected from just above the clavicle to above the facial vein. The clot was now removed from the bulbar end of the sigmoid sinus and free bleeding followed probably from the petrosal. Both wounds were cleaned, mastoid wound packed in the usual manner, and the lips of the neck wound approximated and ligated with one surgical knot, leaving *in situ* a strip of iodoform gauze to act as a drain. The neck wound rapidly healed; the mastoid wound took the usual course, and healed; the middle ear became dry without incident. Patient eventually discharged cured.

The temperature variation of the first week was atypical, the temperature at no time going above 100° ; R. and P. in proportion.

This case is presented to demonstrate how extensive an involvement of the sinus may be present without giving the usual up-and-down temperature or any other signs to point to the gravity of the patient's condition. Here is a man who walks into the clinic with a clot in his lateral sinus at least three to three and a half inches in

length. Secondly, the only physical sign was an cedematous condition over the mastoid region and extending well beyond it.

To point the lesson of this case more thoroughly, I present Case 2.

CASE 2.—B. S., aged six, came under observation June 10, 1908, at the Ear Clinic of the N. Y. Nose, Throat, and Lung Hospital, giving a history of having had scarlet fever two years previously, from which he recovered with a persistent purulent otorrhœa from his right ear. At the time of his appearance at the Clinic the right ear was profusely discharging a foul-smelling thick creamy pus. The left ear was examined and found normal. Cleansing antiseptic treatment was instituted, and this was continued until June 15th, when the mother reported that he had vomited during the previous day, had passed a restless night, had had some temperature, and complained of pain in the right ear. During the examination he vomited excessively and seemed a very sick child. T. 101.6°, P. 120, R. 26.

I sent him to the Red Cross Hospital for observation; because the local condition in his ear, the absence of any mastoid tenderness on either side, and the free discharge of pus, did not seem to me to be the cause of his trouble. On the other hand, a thorough physical examination by the attending physician of the hospital, Dr. L. K. Neff, gave negative results. He was kept under observation until June 18th, when, because of a beginning swelling of the external auditory canal of the right ear, the radical operation was performed; his condition being summed up as an acute exacerbation of his chronic otitis media on the right side.

Operative Findings.—The retraction of the first part after the usual mastoid incision showed a well developed mastoid outline, cortical landmarks well defined. The mastoid process was found partly eburnated, but there were well marked cells radiating about the tympanic cavity and mastoid antrum. These cells were filled with fluid pus and with pseudo-cholesteatomatous masses. An exposure of the sigmoid portion of the lateral sinus was effected at its knee for about $\frac{1}{4}$ inch square. The wall was found to be healthy.

The usual technical procedure to take the post-auricular wall, eviscerate abnormal mastoid and tympanic contents, and cut a Panse flap with primary suture of the post-auricular wound then followed.

It is to be noted in passing that the mastoid process presented no deviations from the normal process of a child six years of age. The day following the operation we find the temperature normal, R. 74, respiration 22. Removal of the outside dressing showed the wound to look healthy. On the night of the second day, the temperature was still normal, but the pulse rose to 102°, R. 26. The child was slightly restless during his sleep, although nothing of an unusual character was observed; occasionally the patient complained of pain in the ear which had been operated. On the morning of the third day after operation the patient was sitting up in bed, crying that he was hungry, presenting normal T., P. 104°, R. 24. At 8.30 that day he had vomited after having taken some gruel. Towards evening he became very restless, had a crying spell, and in a seeming frenzy had torn off his bandages, nevertheless at 11.30 that night he was sleeping, and the evening condition showed T. 101.2°, P. 122, R. 20. The nurse reported a slight attack of what she termed delirium earlier in the evening. On the morning of the 4th day, I found the patient lying on his back perfectly relaxed and unconscious. T. 102°, P. 132, R. 22. His condition alternated between periods of unconsciousness and periods of crying. There was no Koenig sign, no opisthotonus.

The dressings were removed, the stitches taken from the wound, and the entire cavity inspected. The wound was found clean with no signs of pus.

Thinking that there might be some local condition in the meninges or in the sinus (although there were no symptoms to justify such a diagnosis), a few whiffs of chloroform were administered and the tegument removed exposing the meninges, and the bony sinus wall was also removed to expose the sinus. Both were found healthy in appearance and further efforts were temporarily stopped. The child died that afternoon. Tentatively a diagnosis of rupture of a brain abscess was made. Permission for an autopsy was obtained and this showed the meninges normal, no increase in cerebral fluid;

sections of the brain failed to reveal any brain abscess and showed nothing characteristic although many small punctate hemorrhages were noticeable throughout its substance. The wound in the mastoid showed that it had been completely exenterated and an examination of the labyrinth was negative. The sinus on that side was found normal. In the removal of the brain the meninges of the opposite temporal bone were left *in situ*, and as a last resort, while looking for the cause of death, this was pulled from the cerebral surface of the temporal pyramid. In doing this, the left sinus was uncovered and torn, and we were surprised to find within it a yellow semi-liquid mass. The skin over the left mastoid was then retracted, cortex exposed, and realizing then that I was dealing with a thrombosis of the lateral sinus on the left side of the head I endeavored to open the left mastoid. The first stroke of the chisel showed the sinus covered only by a thin cortex, and further efforts were stopped until we had extracted the temporal bone. How far toward the torcular the clot extended we could not make out, as part of the mass was lost in the debris following the removal of the brain. It completely filled the sinus from the knee to the bulb and beyond. The thrombus was partly organized and yellow, and from its macroscopical aspect was pronounced by the pathologist, Dr. Gonzales, a fatty degeneration of the thrombus. He estimated that it had been *in situ* for at least a week or ten days. The specimen I present is of this left ear. It showed the middle ear filled with pus and detritus, the antrum small, and no other cells evident at all. The sigmoid sinus lies directly under the cortex and takes up the entire partly rudimentary mastoid tip. There is no evidence of a real mastoid cell, if we leave out of account the small space directly under the mastoid fossa, and at the angle formed by the two sides of the petrosal pyramid. The contrast of this side to that upon which I operated is very marked, aside from the other peculiarities of this case.

Here then was a case in which a thrombus developed during an acute invasion of both ears, in which marked pyæmic symptoms were absent. On the right side, because of its previous history and local findings and

because of the pain, an operation was undertaken; the left side, because of congenital mal-development and resulting anatomical peculiarities, permitted pus to travel direct from the tympanic cavity to the sinus, which was in almost juxtaposition, and a thrombus was thus engendered. This thrombus was evidently not of a very infectious variety and became organized, and then, either because of the trauma to the head during the operation on the opposite side or because of some other extraneous factor, it underwent fatty degeneration, and from the dissemination of this fatty material the patient succumbed.

At no time during the patient's illness was there any complaint of pain in the left ear, and when the other ear was bandaged the patient seemed easily to hear ordinary conversational tones with his left ear up to the very time that he became unconscious. There seems to be a need for an analytical study of all the atypical cases of sinus thrombosis in order that some data of diagnostic value may be accumulated.

A CASE OF UNSUSPECTED NECROSIS OF THE
PETROUS BONE. MENINGITIS. DEATH.
CO-EXISTING MASTOID SUPPURATION AND
EXTRADURAL (CEREBELLAR) ABSCESS.

BY HILL HASTINGS, M.D., LOS ANGELES, CAL.

(*With one photograph on Text-Plate XV.*)

A REPORT of this case is made because of the failure to diagnose, before the mastoid operation, the suppuration of the internal ear which likely existed and which with necrosis of the petrous bone was found at autopsy. The perisinus abscess, with involvement of the cerebellar dura found at operation, was accepted as the cause of the fatal meningitis. A similar mistake likely occurs occasionally with most of us, and is only discovered by a routine examination of the petrous bone at autopsy.

T. K., age seventy-two, admitted to the Good Samaritan Hospital, June 20, 1908.

Complaint.—Ear discharge and “neuralgia of the head.”

History.—Onset was four months ago. Abscess in the right ear followed a severe attack of grippe; suffered considerably. The ear discharge has been constant. The past week or two the discharge has been profuse, requiring irrigation every two hours, and running out on the pillow at night. Pain of a neuralgic character has been present since the beginning of the ear abscess, referred to the mastoid and temporal regions of the right side. Of late (the past two or three weeks) the pain has been referred also down the neck

ILLUSTRATING DR. HASTINGS'S ARTICLE ON "A CASE OF UNSUSPECTED
NECROSIS OF THE PETROUS BONE," ETC.



and into the right eye. No swelling over the mastoid has been noticed. No dizziness. Deafness has been profound (claims he has never heard well in the right ear since an abscess in this right ear twenty-four years ago, which healed up promptly). Prior to the present trouble there had been no ear discharge. General condition has been poor; delicate, feeble man, addicted to the use of liquor. Has not been confined to bed entirely. Has not felt as well as usual, but not sick. His temperature has not been taken or recorded and no special notes had been made inasmuch as his condition did not seem in any way alarming.

There has been no chill or high fever, but of late slight fever and some sweating at night have been remarked. There has been no stupor, drowsiness, or vomiting. One week ago had some nausea and vomiting which was attributed to his stomach; no appetite; constipated. No trouble with the bladder. No history of kidney trouble.

Examination.—Patient walked into the hospital and has not gone to bed. Feeble and looks his age. Pulse 110 with some arterial thickening. Temperature 99°. Tongue fairly clean. Mastoid: marked thickening around and behind the mastoid on the right side; tenderness marked on pressure over the mastoid and acute over the point of exit of the emissary vein. No thickening along the jugular. Meatus full of thick pus with a small perforation below and in front of the umbo through which pus continually oozes; pus in the canal had a slight streak of blood. His brother (a physician) states once or twice before there has been a little blood in the pus. No dizziness. Hearing negative to watch and doubtful to conversation. (Smears and a culture taken from the pus showed streptococci.) Examination of the eyes failed to show choking of either disk, but marked injection of the right disk with indistinct margin. Immediate operation advised. (Suspicion of intracranial involvement.)

June 21st.—Operation at Good Samaritan Hospital showed the existence of a perisinus mastoid abscess. On removing the cortex the mastoid found full of pus; welled out under considerable pressure; pulsating. Put throughout the mastoid, with large abscess down on the descending limb of the lateral sinus. The tip found entirely broken down into one

large abscess cavity extending through the inner table into the digastric fossa. The abscess extended from the sinus knee to the tip. Sinus exposed through necrotic softening of the bone and uncovered throughout its descending limb; its wall was thick, as was also the adjacent dura over the cerebellum; no thrombus believed to exist. Slight facial twitching occurred while cleaning out the tip. The posterior zygomatic cells removed up to inner cranial table. Dura of middle fossa not exposed. Wound packed as usual and partial suture.

June 22d. — Patient in good condition except for intestinal distention and scanty urine. Temperature 98° , pulse varying from 56 to 80. Had $\frac{1}{4}$ gr. morphia with strychnine before operation and two injections ($\frac{1}{8}$ gr. morphia with strychnine) during the night to control restlessness. Not much pain in the head; rational; says he feels well except griping pain in the abdomen. Urine scanty (24 hours' specimen before operation showed 496 cc., 1024 sp. gr., albumen none; casts, considerable number of hyalin). After operation, no urine voided for sixteen hours, when 352 cc. of urine voided, but lost. The colon considerably distended, also the stomach. No facial paralysis.

July 13th (22d day after operation). — Patient had made an uneventful convalescence to this date. Had not had any fever; had been sitting up a part of each day on the porch. Slight headaches, but no return of the severe headaches and pain in the mastoid. His brother had gone back to his home. The mastoid was filling in clean and red. Dressed daily. Still some creamy pus discharging into the mastoid wound from the middle ear (likely due, it was thought, to the long-standing middle-ear suppuration), a few drops at a time; not enough to cause uneasiness. A small amount of pus can also be squeezed out by pressure on the neck just behind and below the mastoid.

July 17th. — Four days past a gradual and progressive change for the worse was apparent. Patient had grown weaker; become more restless and slight delirium was noticed. His temperature had varied from 99.2° to 101° the past two or three days. No paralysis and no focal symptoms were apparent. Eyes examined and showed no choking of the

disks. A marked nystagmus was seen when patient was directed to look away from the affected side, lateral in character with slight rotary motion. When eyes were directed towards the affected side no nystagmus was seen. No involvement of the third, fourth, fifth, sixth, or seventh nerves was apparent. Kernig sign, questionably present. Some pain behind the mastoid. Mastoid wound clean and nothing to account for the lighting up of symptoms that were suspicious of intracranial involvement.

July 18th.—Marked change for the worse occurred during the night. Patient delirious at intervals; answered questions when aroused. Some twitching of the muscles of both arms. No convulsions; no localizing sign or symptom. Slight fever. Pulse 110 to 120. No vomiting. Nystagmus cannot be made out. Slight stiffness of the neck. Meningeal taché marked. The diagnosis of meningitis, resulting from an unopened abscess, was made. An exploratory operation suggested as the only hope and a poor prognosis given.

July 18th.—Operation. An effort was made to find the localized collection of pus which was believed to exist from which the general meningitis was resulting. The findings at the time of the previous operation, namely, the carious defect in the inner table of the posterior fossa, exposing the sinus and cerebellum, pointed to the posterior fossa as the possible site for the pus. The cerebellum was accordingly uncovered behind and below the sinus, but no extradural collection of pus was found. The dura was normal. The cerebellum was then uncovered in front of the sinus in the angle between the sinus and the antrum and found normal. The cerebrum was uncovered above the antrum, and no extradural collection of pus found at this location, nor any signs of present or past pachy-meningitis. It was then concluded that an intradural abscess must exist from which the general infection had resulted. The cerebellum and the temporo-sphenoidal lobe of the cerebrum were explored, but no abscess found. The lateral sinus was then opened and found normal. Patient was returned to bed without the cause for the general meningitis having been found.

The patient died at 2 A.M., July 20, 1908, thirty-four hours after the operation, without any changes in the course of

the general meningitis being noticed. Autopsy was asked for and permitted, to the extend of examination of the brain.

Autopsy.—Calvarium removed; no extradural collection of pus seen. Outer surface of dura practically normal in appearance. On stripping off the dura from the cerebrum, pus found scattered all over both hemispheres. No collection at any one place except at the base of the brain. In the interpeduncular space there was sufficient pus accumulated to obscure landmarks until wiped off. The pus exudate was confined to the pia and arachnoid. On stripping off the membranes the surface of the brain was apparently not diseased. Section of the cerebrum failed to disclose any local collection of pus or signs of encephalitis. The ventricles were normal, apparently free from purulent extension. Examination of the posterior fossa showed the cerebellum to be entirely free from pus except on the left side near the anterior border, where a surface area about the size of a quarter was covered with pus. Section of the cerebellum failed to show any localized collection of pus (an abscess of the brain, not reached by operation, was diagnosed and considerable chagrin felt at not finding such). The base of the skull was then examined. It appeared apparently normal, but on stripping the periosteum from the petrous bones an abscess cavity was found at the tip of the petrous bone of the right side. (See accompanying photograph.)

The petrous bone, from the prominence of the superior semicircular canal inward, was greatly altered in appearance by reason of the necrosis that was found. At the tip was an abscess cavity about the size of an ordinary bean, in which a sequestrum was found. This abscess cavity was in immediate contact with the carotid artery. The abscess cavity had been covered by, and only discovered upon stripping off, the Gasserian ganglion. External to this abscess cavity the bone was found necrotic with here and there pus in small amounts as far as the prominence of the canal. At the site of the cochlea, the bone was softened by necrosis, and on removing with the curette this softened bone, the anatomical appearance of the cochlea could not be made out. It was believed that the cochlea was full of pus and the bone surrounding had become softened. The superior semicircular

canal was opened (the bone covering it was not necrosed). The lumen of the canal did not contain fluid pus, but was reddish in appearance. The tympanum was full of pus. It was impossible to make out the connection between the diseased tympanum and the diseased internal ear and petrous bone, due to the faulty dissection. A fistula would likely have been found had we taken the precaution to examine the tympanum first instead of following the necrotic petrous bone from within outward.

The photograph, taken before touching the petrous bone except with cotton to wipe out the pus, shows, on careful examination, the difference between the diseased and the healthy side.

BACTERIAL SUSPENSIONS IN THE TREATMENT OF AURAL SUPPURATION.¹

By RAY CONNOR, A.B., M.D., DETROIT, MICH.

THE problems of immunity are endless in their multiplicity and complexness. The forms of immunity are varied in the different ills to which flesh is heir. It is not my purpose to-night to go into a discussion of the theories either of antitoxic, bacteriolytic, or phagocytic immunity, but merely to present a few clinical observations on the use of suspensions of dead bacteria introduced into the systems of patients having localized infections in the temporal bone. While much has been written on the general subject of bacterial inoculations, still very little has appeared as to its usefulness clinically in ear conditions, and this may serve as an excuse for the cases quoted to-night. The value of the opsonic index certainly seems open to question as a guide in giving bacterial injections, and, from considerations of time, had to be omitted in these cases. Whether or not the results would have been better had it been employed, I cannot of course say.

Let us first consider the cases of suppuration treated without operation. These are all chronic cases and most of them very unpromising ones.

ANNIE T., white, æt. fifteen months, was admitted to the Children's Free Hospital, June 20, 1908, with pneumonia,

¹ Read before the Detroit Ophthalmological and Otological Club, Dec. 1, 1908.

which ran nearly two weeks before the left ear was seen to be discharging profusely. On examination the left ear showed a large round perforation behind the malleus, with no mastoid tenderness or swelling of the canal wall. This was treated by irrigations until August 6th, when a culture was taken and proven to be pure streptococcus. A vaccine was made and given in from 10-25 million doses weekly until October 29th when the discharge had completely ceased, and on November 6th the patient was discharged cured and has not been seen since. Thus a case which had resisted treatment for a month cleared up only after nearly three months' treatment with the injections.

ROY M., white, æt. four days, was admitted with an ophthalmia neonatorum. It was a malignant case. Both corneæ were badly infected, and in spite of all treatment both eyes were lost, the lens on one side being extruded. On January 4, 1908, a purulent discharge from the right ear was noted. On January 8th, the discharge was very profuse, the ear excoriated, and the canal wall swollen so much as to prevent the recognition of any landmarks in the fundus of the ear. A culture showed Friedlander's pneumobacillus. On January 11th, the patient was given ten million of the dead bacilli and six days later it was noted that the discharge from the right ear was less. There was less swelling of the canal wall, but a marked drooping of the posterior superior canal wall was still present. The left ear was now found to be discharging a thin muco-purulent secretion, and great drooping of the superior wall was found. An internal Wilde's incision was made and staphylococcus aureus isolated from the discharge. The patient was then given weekly doses of both organisms varying from 50-200 million of the staphylococcus and from 25-50 million of the bacillus. This was continued for about six weeks and showed improvement after four weeks. On March 14th, there was no discharge from either ear, the drums were gray, and the swelling of the canal had subsided. The general condition of the patient was poor and he weighed but five pounds. Local treatment was discontinued and the patient went home, where he died a few weeks later without any return of the discharge. This case is interesting in that the ear which began to discharge after

the treatment was begun showed a different organism from the first ear, and the effort to produce a relative immunity to one organism did not prevent another from getting in its work. This case was the exception to the general rule, that improvement in the aural condition is accompanied by a general improvement.

PEARLIE J., white, æt. ten months, was in the hospital for other complaints. In January, 1908, the baby had an attack of scarlet fever and when seen January 26th, the left ear was discharging freely. There was no great swelling of the canal wall and a culture showed staphylococcus aureus. A suspension was made and the baby given injections varying from 50-500 million at weekly intervals until June 1st. On March 24th, there was still a large anterior perforation, no discharge on irrigation, and only a little in the tympanum. The patient gained weight and improved generally very much. On April 23d, there was still a slight discharge from the ear, which cleared up during May and the baby was allowed home. We later heard from the mother that the ear was discharging again. The perforation never closed and the case can hardly be classed as cured.

CHLOE N., white, æt. seventeen months, was admitted March 26, 1907, in a miserable condition, from an institution in another city. Both ears were discharging profusely. The patient had a large bed sore over spine, enlarged glands in neck and groin, and a hemorrhagic petechial eruption over body. The right drum was not bulging and the canal wall was not swollen. The left canal wall was swollen, large tympanic perforation present, and the landmarks of the drum not to be made out. April 7th, a large perilaryngeal abscess was opened by Dr. B. R. Shurly. A month later the child still looked miserable and had gained little. Local treatment to ears and general supporting treatment was used during the summer without great improvement. On October 22d, a culture from the left ear showed a mixed infection of staphylococcus aureus and albus. A mixed vaccine was made from 24-hour growths, and injections given at intervals of from five to seven days and ranging in amount from 100-500 million. This was continued well into January, 1908, and the child's general condition began to pick up almost at once.

She gained in weight from 14 pounds to 21 pounds 14 ounces, and the discharge diminished steadily. On November 23d, the right ear showed no discharge, but a large perforation and some moisture in the tympanum. The left ear was dry, drum white, perforation open and showing no signs of closure. The patient showed a slight rise of temperature after a dose of 500 million, but none on dropping the dose to three hundred million. On January 8th, both ears were dry. On January 18th, the left ear dry, drum gray, and still shows a small anterior perforation unclosed. Right ear dry, drum gray and shows a large perforation of the lower part of membrane. Inner wall of tympanum not congested. The patient was discharged January 21st. About two weeks later it was reported from the Home of the Friendless that there was some aural discharge. I have not seen the case since. It is unfortunate that no cultures could be obtained from the recurrent discharge in these last two cases, as it leaves one uncertain whether the patient was suffering from a new infection with some other organism or from a lighting up of the old infection for which no effective immunity had been established.

Eva R., white, æt. five years, was readmitted on January 11, 1908. She was an old hospital case, coming in months before with typhoid. She developed mumps and then diphtheria. Then had scarlet fever and chicken-pox. The ear began to discharge on December 27th. On January 13th, the right ear showed a moderate amount of muco-purulent discharge with a foul odor. Most of the drum was gone, there was a tit-like drooping of the posterior superior canal wall, but no mastoid tenderness was present. A culture showed a mixed infection of pneumococcus and diphtheria bacillus. She was given injections at weekly intervals varying from 5-50 million diphtheria bacillus and 10-50 million pneumococcus. On February 8th, there was very little discharge in the middle ear. On February 23d, some patches developed in the throat and the patient was returned to the contagious hospital for a week. The later part of April the discharge ceased and did not start again although she was kept under treatment until the last of August. She was watched until September

24th and then allowed to go; I have not heard from the case since.

STASIA M., white, æt. $2\frac{1}{2}$ years, was admitted from another institution November 6, 1907, without any history. The right ear showed a muco-purulent discharge, landmarks and most of drum gone, and granulation tissue in the middle ear. Numerous streptococcus and a few staphylococcus colonies were found in the culture taken from the discharge. She was given injections at from 5-7 days' intervals, varying from 100-500 million of the staphylococcus aureus and from 10-50 million of the streptococcus, until February 22, 1908. The discharge varied a good deal while under treatment, sometimes being very little and at other times a great deal. On January 8th, there was little discharge, but the condition of the tympanum was much the same as when beginning treatment. A culture showed abundant yellow staphylococcus. The condition of the patient remained much the same until February 22d, when a radical operation on the ear was advised and refused. The case was discharged uncured.

These cases comprise the unoperated chronic middle-ear cases that I have treated for any considerable length of time, and do not make a very brilliant showing for this method as the routine treatment in this class of cases. They all required months of treatment, one was entirely uncured, and at least two of them recurred after leaving the hospital. They were, however, very unpromising specimens and possibly private cases in good surroundings might do better.

One case was treated without material result for four months and then subjected to a radical mastoid operation. ROSABELLE M., white, æt. five years, was admitted to the hospital with cerebro-spinal meningitis from which she recovered. She had had a discharging ear since infancy. On examination a profuse muco-purulent discharge was found in the left ear. The short process of the malleus could still be seen, but the lower part of the drum was completely gone; granulation tissue was found in the tympanum, but no dead bone could be felt with the probe. There was no swelling of the

canal or tenderness over the mastoid. A culture showed one of the proteus group present, and treatment was begun on November 14th with fifty million and continued in doses running up to one billion at from five- to eight-day intervals until July 11, 1908. After the billion dose the patient felt sick, with pains in the head and back, and showed a slight rise of temperature. This passed off in a day or two and did not follow smaller doses. On January 8th, there was still a thick, purulent, bad-smelling discharge, but not enough to run out of the canal. Local conditions were unchanged and a culture still gave proteus. On May 5th, the improvement was so little that a radical mastoid was done under ether. The mastoid cortex was found greatly thickened and sclerosed. The antrum was small. Only a small part of the head of the malleus was found in the tympanum. The wound healed slowly and now shows only a little moisture in the region of the tube. Cultures taken recently showed no proteus but a few staphylococcus colonies, so that the immunity to the proteus seems permanently established. The injections which followed the operation did not, as far as one can judge, seem to influence the healing to any marked extent. Other similar cases under like conditions seem to do equally well with local treatment alone.

Several acute mastoids which have had simple mastoid operations have been treated throughout the post-operative period but without striking results.

HARRY S., white, æt. 5½ years, was admitted July 21st through the kindness of Dr. Frothingham. Patient had measles four weeks before and ears have discharged since. A swelling behind the left ear was noticed four to five days ago. This post-auricular abscess was opened under ether, and the mastoid was found sclerosed and filled with granulation tissue. The sinus but not the brain was slightly exposed at operation. The antrum was opened freely, but the tip was not completely removed. On July 24th, the wound was dressed and considerable discharge found. There was some discharge from the left ear but none from the right. On August 1st, a culture from the left side showed two staphylococcus aureus colonies and many streptococcus colonies.

On August 5th, the index to streptococcus was found to be .69 and ten million streptococcus suspension was given. On August 9th, the index was found to be .92 and there was no discharge from the canal. Injections running from ten to fifty million were given at weekly intervals until September 14th, when the boy was discharged with the wound practically well.

A case of epidural abscess which did not heal well after six weeks was given some injections of the micrococcus catarrhalis and the wound showed immediate improvement and was completely closed about three weeks later. Another similar case of epidural abscess was treated with autogenous streptococcus and staphylococcus aureus suspensions, beginning ten days after operation, but healed slowly and was not completely closed after three months' treatment. Repeated cultures gave only staphylococcus aureus. When, however, the injections were stopped, the progress of repair retrograded rapidly and the amount of secretion increased greatly. In still another simple mastoid the repair went along nicely for about two months when progress seemed to stop. A wound about 1cm long and 1cm deep was present, and while only secreting moderately still showed little tendency to close completely. A pure culture of staphylococcus albus was found and a few injections closed the wound completely and permanently in a couple of weeks.

The cases which have been longest under treatment are of course chronic ones, and in these perhaps the bacterial suspensions have been of the greatest service.

EMMANUEL R., white, æt. six years, was admitted June 2, 1906, with a chronic mastoiditis. The patient had had black diphtheria and scarlet fever two years ago at the same time, and was blind, deaf, dumb, and paralyzed for a year following this. He had received treatment in various clinics. When first seen, both drums were gone and a profuse mucopurulent discharge was present. Watch was heard only on firm contact and the voice badly at one foot. He was treated locally for a time and on September 13, 1906, a radical mastoid was performed on the left ear. The cortex was found very hard, the antrum large and filled with a mucoid

discharge, and the mastoid diseased to its tip. All diseased tissue was removed from the mastoid. The tympanum was curetted and only a little of the head of the malleus found. The wound healed poorly after operation, and the middle ear did not epidermatize, so that on January 23, 1907, the mastoid incision was reopened and the mastoid and middle ear recuretted and grafted with Thiersch grafts from the patient's thigh. The wound still refused to heal well, and on April 21st, Bier's hyperæmia treatment was applied for twenty hours out of twenty-four and continued for about four months with indifferent success. On August 9th, there was still discharge and odor from the operated side. A culture taken proved to be practically a pure culture of pyocyaneus with a few staphylococcus. On August 13th, he was given one hundred million of the pyocyaneus suspension. Four days later there was much less odor and discharge and the green color had disappeared from the dressings. Treatment, continued up to the last of October, caused the greatest improvement in the local conditions. On October 14th, cultures taken from the left ear showed no growth at the end of twenty-four hours. On October 20th, the patient was sent home to get a little change before operation on the other ear. There was a little moisture in the region of the tube, but otherwise healed and with some improvement in the hearing. One must consider the long and ineffectual treatment in this case to appreciate the value of the bacterial treatment. The right ear was operated on this year and, whether or not due to the bacterial treatment of last year, healed very much more readily than the left one.

CHARLIE H., white, æt. two years, has been in the hospital with one thing and another practically all his life. When two months old his ears began to discharge, and in spite of all kinds of treatment have continued to do so since. On May 9, 1907, a meato-mastoid operation was done under ether, with an immediate grafting of the wound on the left side. The cortex was found to be very thick and dense. The antrum was large and filled with muco-pus. The wound did not heal well after operation and the patient came down with chicken-pox. Bier's hyperæmia treatment was tried for about two months without success. On July 14th, there

was not much discharge, but considerable odor, and cultures showed colon infection. The index to colon was .9, and on July 18th ten million of a colon suspension was given. Injections were given weekly in increasing doses. On July 30th, there was still slight discharge and odor, and a culture still showed colon. On October 12th, the wound was practically healed, and a culture taken two days later showed no growth after 21 hours. On October 17th, a culture taken from the right ear showed a pure culture of staphylococcus aureus. Suspensions of colon and aureus were continued until January 4, 1908, when both ears began to discharge again. A culture taken from the left ear showed Friedlander's pneumobacillus. Suspensions of the pneumobacillus and aureus were given until February 22d, when the patient went home for a few days. On March 27th, a radical was done on the right side, but the middle ear still shows slight discharge. A culture recently taken from both sides showed pure pyocyaneus infection, which has improved greatly under injections of pyocyaneus suspensions. This case was, however, apparently cured permanently of a bad colon infection, but the unoperated ear was little influenced by treatment.

The patient I have had longest under continuous treatment is ERWIN E., white, æt. $3\frac{1}{2}$ years, who was admitted May 30, 1905, with a diagnosis of mastoiditis. Two weeks previously he had been operated on at another hospital for adenoids. The left ear was found to be discharging profusely, with a very tender canal, marked bulging of the posterior superior wall, but no swelling or tenderness over the mastoid. The patient looked sick and miserable. An internal Wilde's incision was made and the patient put on aural irrigations. On June 4th, the right ear required an internal Wilde's incision. The patient continued to do badly, and on June 13th both mastoids were opened and found filled with pus and granulation tissue from aditus to tip. The mastoids were thoroughly cleansed out and the remains of tonsils and adenoids removed. The patient was very sick after the operation and nearly died. His general condition improved slowly, but the wounds did badly, and after long treatment the left ear was still discharging and bare bone could be felt on the left side. A radical was done

on the left ear on December 5, 1905. The old mastoid wound was found filled with exceedingly unhealthy granulation tissue and was cleaned out. Ten days later a skin grafting was done, but most of the graft sloughed out and the wound broke down. On June 30, 1906, the sinuses on both sides were discharging freely. A tuberculin test was tried but no reaction obtained. A course of antisyphilitic treatment yielded little result. On October 27, 1906, Dr. Ohlmacher got a streptococcus from the right side and an albus from the left. A streptococcus suspension was made and small doses tried for a few weeks without much permanent improvement. On April 21, 1907, Bier's hyperæmia treatment was begun and tried for ten weeks without much success. On July 6, 1907, a suspension was made from a streptococcus obtained from the right side and twelve million given. The index for the next day for streptococcus was found to be .5. On July 9th, the index had risen to .88 and two days later fallen to .6. The discharge was much less. On July 13th, given twenty million. There had been practically no discharge in the past three days. On July 14th, the index to streptococcus was .58. On July 28th, a culture from the left side showed staphylococcus albus and suspensions of this organism were given at the same time with those of the streptococcus. On July 31st, the index for staphylococcus albus was 1.1, and on August 9th the index to streptococcus was .54. The patient has been under weekly injections since this time, making something over a year's treatment. The highest dose was one hundred million streptococcus, one billion staphylococcus aureus, and three hundred million staphylococcus albus all given at the same time. The smaller doses, however, seem to do better. At present there is no discharge from the right mastoid and little from the left, which is epidermatizing slowly. It seems to be a case of very low resistance to the streptococcus, which responds but poorly to treatment.

In the many hundreds of injections given, some to miserably-nourished babies, I have never had any abscess formation or trouble at the site of inoculation. The general symptoms from the inoculations have been

marked in a few instances but have never been alarming. No case seemed harmed in any way, although in many the effect was not marked clinically.

CONCLUSIONS.

This is not a method available for routine or general use in the chronic suppurative diseases of the ear.

Those cases in which free drainage has been established by operative means are the most likely to be benefited.

Benefit may be obtained in some intractable cases which resist all other means of treatment.

Secondary operations may sometimes be avoided.

My thanks are due Parke, Davis & Co.'s research laboratory for the courtesies which made these studies possible.

REPORT OF THE MEETING OF THE AUSTRIAN OTOLOGICAL SOCIETY.

BY DR. ROBERT BÁRÁNY OF VIENNA.

Translated by Dr. GERHARD H. COCKS, New York.

MEETING OF JUNE 22, 1908.

V. URBANTSCHITSCH (1) demonstrated a case of tubercular disease of the middle ear in a patient with pulmonary tuberculosis. Before operation, hearing power for C sharp $2m$, and F sharp $\frac{1}{2}m$. The patient hears Bárány's noise apparatus without difficulty. Marked fistula symptom. Considerable rotatory and horizontal nystagmus toward the diseased side is exhibited when pressure is made over the tragus. This shows even more clearly when the air in the auditory canal is condensed. During rarefaction, nystagmus occurs to a slighter degree in the opposite direction toward the sound side. During bending and quick movements of the head there are also vertigo and nystagmus. Caloric reaction present. The diagnosis of fistula of the semicircular canal was made,—apart from the operation,—and taking into consideration the preservation of the hearing, Neumann's local anæsthesia was employed because of the pulmonary involvement. After the completion of the radical operation a broad fistula was seen in the semicircular canal. Above this fistula, opposite the middle cerebral fossa, a sequestrum was wedged in between the pyramid and the dura. When Urbantschitsch grasped this sequestrum and moved it with moderate force, the patient complained of considerable vertigo and twitching of the eyes (nystagmus). As soon as the sequestrum was removed, the patient's head felt free and the

vertigo ceased. Pressure upon the fistula with cotton did not produce vertigo. Following the operation, rotatory nystagmus toward the sound side occurred for a time, which gradually diminished in intensity. The patient is now completely deaf; the caloric excitability has greatly decreased. Spontaneous vertigo has not occurred since the removal of the sequestrum. Urbantschitsch leaves the question open whether this sequestrum pressed upon a second fistula situated in the superior semicircular canal, or whether the vertigo was caused by the pressure exerted upon the dura by the sequestrum at the moment of extraction.

Urbantschitsch (2) reported the autopsy findings in a patient who died from purulent meningitis of otitic origin. She came to the clinic with remarkably few symptoms. A chronic middle-ear suppuration was present. At operation, Urbantschitsch found the dura of the posterior and middle fossæ, together with the sinus, covered and infiltrated with pus. Because of the high temperature, Urbantschitsch incised the dura and evacuated purulent serum. Incision of the brain disclosed no pus. Completion of radical operation. On the first day after the operation the general condition was good. No headache. On the second day slight frontal headache, soon coma, and exitus. Ruttin stated that there was a post-mortem rise of temperature. At the necropsy, Störck found a purulent meningitis. In the sinus petrosus superior there was a purulent thrombus. The slight clinical manifestations were a striking contrast to the fulminating meningitic process.

BÁRÁNY: Diagnosis of labyrinth fistula with demonstration. Bárány presented a patient on whom Prof. Urbantschitsch operated because of chronic suppuration and labyrinth fistula. The interesting point in connection with the case is that the patient was carefully examined clinically before the formation of the fistula. This examination was carried out by Dr. Kiproff, who is at present working upon the exact determination of caloric nystagmus. Dr. Kiproff states that caloric nystagmus, at the first examination, began 15" after irrigation with warm water at 30° Celsius, and lasted 2' 20". In the sound ear, nystagmus began after 10" and lasted 3' 5". Rotatory nystagmus toward the diseased side

lasted 55" after 10 revolutions; the rotatory nystagmus toward the sound side, 40" after 10 revolutions. Fistula symptom negative. The hearing distance for Cs, 6m; and Fs, 1m. Eight days after this examination the patient came complaining of vertigo, which began suddenly, three days before. There is considerable vertigo when walking, when making rapid movements of the head, and upon bending. When inclining the head backward a more marked nystagmus toward the diseased side is noted. There was no spontaneous alternating nystagmus, but there was slight nystagmus toward the sound or diseased side. When testing for the fistula symptom condensation of the air causes marked nystagmus toward the diseased side, and rarefaction a slighter degree of nystagmus toward the sound side. The caloric test shows nystagmus begins after 30" when syringing with water at 30° C. and lasts 3' 20". In the sound ear, it begins after 15" and lasts 2' 50". The duration of rotatory nystagmus is 40" to the diseased and 45" to the sound side. In a second examination, three days later, the caloric nystagmus in the diseased ear begins after 10", lasts 3' 10"; while in the sound ear it begins after 15" and persists 2' 55". Rotatory nystagmus toward diseased side 1'; toward sound side 45". Fistula symptom same as before. Hearing power same as at first examination. At the radical operation, a distinct fistula was found in the semicircular canal. After operation, the nystagmus toward the sound side ceased, the hearing power was lowered considerably, and the irritability of the vestibular apparatus was substantially diminished. This report is of great interest because it is the first case where an exact functional examination of both cochlear and vestibular apparatus was made before a fistula originated spontaneously. This case seems to indicate that an abnormal irritability of the vestibular apparatus was caused by the formation of a fistula, which manifested itself in the occurrence of attacks of vertigo (spontaneously and with movements of the head). However, a hypersensibility of the vestibular apparatus, as Alexander has already assumed, was not present; for the figures obtained by Dr. Kiproff agree fully with average figures in middle-ear suppurations having a similar anatomical character. Whether there is actually a physiological hyper-

susceptibility by which the vestibular apparatus responds to physiological irritation by increased function, appears to Bárány doubtful.

In connection with this case Bárány reported his experience during the last few months in the University Ear Clinic of Professor Urbantschitsch, in connection with the fistula symptom. Altogether 160 patients were examined for fistula before operation. Of these, 145 cases exhibited no fistula symptom, and no fistula was found at operation. Bárány emphasized the fact that he knew of no case, carefully examined before operation and showing no fistula symptom, where a fistula was found at operation. All of these cases also showed typical caloric excitability. In 4 cases where there was no fistula symptom, caloric excitability was negative. In all of those cases where the diagnosis of labyrinthine suppuration was made at operation, the fistula was found and the labyrinth operation performed. In 11 cases the fistula symptom was present before operation. So far, 9 of these have been operated upon. In all, the fistula was situated in the semicircular canal. Six cases showed a pronounced fistula symptom, also marked nystagmus during both condensation and rarefaction. In these cases the caloric excitability was normal; in some the hearing power was present, in others deafness. In three, the fistula symptom was very slight; in place of nystagmus there was only a very slight slow rotation of the bulb, but always in an opposite direction during condensation to the motion during rarefaction. In all, caloric excitability was either greatly reduced or abolished, and deafness present. In our hands, then, the fistula symptom has proved completely trustworthy. It should be noted that we have, by chance, only happened to observe semicircular-canal fistulæ. In most of the cases the nystagmus was in a direction toward the diseased side when the air was condensed, yet Bárány has already seen exceptions in semicircular-canal fistulæ.

In 1906, Gradenigo reported at the Tenth Congress of the Societa Italiana di Laryngologia, Otologia, et Rhinologia the investigations made in his clinic by Dr. Mimidian. The latter tested a number of cases by air condensation and rarefaction. He observed a nystagmus which occurred in

the same way in rarefaction and condensation, and which was seen most clearly in alternating rarefaction and condensation. Gradenigo did not draw any further conclusions from these findings. His observations induced Bárány to try systematically the fistula symptom. Bárány stated that where air condensation generally produced a nystagmus, rarefaction always caused nystagmus in the opposite direction. Dr. Mimidian's experience may depend upon a change in the caloric nystagmus, since the condensed air is not completely shut off, and repeated condensations and rarefactions finally produce a caloric nystagmus through the current of air.

In January, 1908, in the *Wiener klinische Rundschau*, xxii., Nos. 1 and 2, is a work by Alexander and Lassalle, entitled "A Clinic on Labyrinthine Nystagmus." In the April *Monatsschrift f. Ohrenhkl.*, an attack by Mackenzie appeared in which a number of Alexander's newly-published cases are cited and two more cases added. Alexander alleges that he has found a positive fistula symptom in all of these cases, but no fistula. Alexander's cases may be divided into three groups:

1. Cases which from the history show with great probability that there is a fistula of the stapes or round window.
2. Cases which from the description of the fistula symptom show with great probability that there is a fistula of the stapes or round window.
3. Cases which from the post-operative course show with great probability that there is a fistula of the stapes or round window.

CASE 1.—Before operation, vertigo repeatedly. The test for the fistula symptom showed distinct rotatory nystagmus toward the diseased side during condensation, and the same toward the sound side during rarefaction. Symptoms of acute labyrinthitis appeared immediately after operation.

CASE 10.—Thirteen-year-old boy with bilateral chronic suppuration. With strong condensation in right canal, rotatory nystagmus to the right; with slighter condensation in left canal, stronger rotatory nystagmus to the left. No mention of nystagmus with aspiration. The disproportion

between the nystagmus on the right and left sides is best explained by a left-sided stapes fistula.

CASE 11.—Before and after operation, attacks of vertigo. Facial paralysis. During condensation in diseased ear rotatory nystagmus toward the diseased side.

In all these cases, as Alexander found no fistula of the semicircular canal, we must accept a stapes fistula. In any case the opposite view, that none existed, cannot be proven. There still remain three cases in which Alexander obtained rotatory nystagmus toward the sound side during condensation. In one operative case there was no vertigo, either before or after operation.

In two cases in which the perforation in the drum closed in the course of treatment, there was no longer any nystagmus upon compression after the closure of the perforation. Bárány thought that there was a change in the caloric symptoms, due to air being forced repeatedly into the external canal, just as in rare cases a caloric nystagmus is caused by air being forced into the tube.

Finally, Bárány cited a case where Leidler confused the fistula symptom with the associated Stransky's nystagmus. The case in question was presented at the last meeting. Leidler proposed incision of the dura. In the presentation of this case Leidler did not mention compression nystagmus, otherwise Bárány would have answered him at the time. It was noted in the history sent to Bárány that compression on both ears started nystagmus. Bárány accidentally had an opportunity to examine this patient two or three days before he was admitted to the Policlinic, and stated he showed the associated Stransky's nystagmus very markedly. Bárány demonstrated to his hearers how easy in this case it is to confuse this nystagmus with the fistula symptom. Here there occurred, not only in air condensation and rarefaction, but also in pressure on the mastoid, on the tragus, and when tightly closing the eyes—a tolerably strong oscillatory nystagmus with simultaneous movements of the lids. That so practiced an observer as Leidler could be mistaken, proves how difficult it is to make accurate and exact observations in this field.

In Alexander's cases, he speaks mostly of nystagmus during

compression alone. But, according to Bárány's meaning, a fistula may only be diagnosticated if, during compression, nystagmus or vestibular eye movements are perceivable in one direction; during aspiration, in the opposite direction. In this connection Bárány desired to make an observation. Aspiration should follow immediately after compression, and the olive tip should not be removed from the ear after compression, and then the balloon compressed so that aspiration can be tried independently of compression; for condensation forces the movable parts into the fistula and interior of the labyrinth, thereby producing a movement of the endolymph. Aspiration should be performed at once, then the opposite endolymphatic movement occurs immediately, and the soft structures in the fistula are sucked at once into their original position or are drawn somewhat farther outward. If the olive is removed after compression, the soft material in the labyrinthine fistula gradually flows back spontaneously into its original position, and when aspiration is finally carried out much greater force must be employed to produce motion of the endolymph.

Bárány, in conclusion, desired to mention a point which Alexander alludes to in his paper. In twenty normal cases Alexander was never able to evoke the fistula symptom, yet he states that formerly when making Gellé's test he met with occasional complaints of vertigo. His daily notes read: "In Gellé's experiment in normal cases vertigo appears to occur if the external auditory canal is not closed in an air-tight manner. The air flowing out with a hissing sound, and the movements which in such cases the patient makes with his head may explain the statement that vertigo is experienced." From this remark, Alexander goes on to say that he first of all performed Gellé's test incorrectly, for if the external auditory canal is not stopped in an air-tight fashion it is not Gellé's test, but an inflation, and as a matter of course the patient hears nothing. Moreover, it is readily conceivable that in repeated examinations of this sort caloric nystagmus may have occurred.

Bárány next spoke of a paper by Jansen. In the Fourteenth Report of the American Laryngological, Rhinological, and Otological Society, Pittsburg, May 28, 29, and 30, 1908,

Jansen read a paper upon "The Treatment of Purulent Suppurations of the Labyrinth, on the Basis of Fifteen Years' Experience." Jansen has had an extraordinarily large amount of material, but the majority of his cases were not examined in a manner free from objection. Of late Jansen has employed the caloric test of the vestibular apparatus, but he does not speak of the fistula symptom. At least, Bárány found no mention of it in his work. Stapes luxation plays a great rôle in his paper. If the description of these cases is compared with the cases of so-called serous labyrinthitis of Alexander and Voss, one finds a certain similarity. In these cases nystagmus and vertigo do not begin immediately following injury, but 12 or 24 hours after it, or even later. Jansen has observed 19 examples, of which only 2 healed without a labyrinth operation. Stapes luxation happened only 6 times during radical operation, 12 times during the after-treatment,—notably during curettage. The labyrinth operation was performed 13 times; in 9, healing took place. The principal distinction between Jansen's and Alexander's cases consists in the former's high mortality, while the cases of Alexander and Voss all healed. Jansen states correctly that a caloric reaction will still be obtained on the first and second days, and also that the caloric test may not prove with certainty suppuration of the labyrinth. Bárány believes that the fistula test should be performed to distinguish cases of stapes luxation from serous meningitis, whether it be with the help of a sterilizable rubber-ball which can be placed over the entire wound area and fitted in an air-tight fashion, or whether it be with the help of a pledget of cotton which is carefully pressed against the region of the stapes. If no fistula symptom exists before operation, and a fistula symptom can now be demonstrated from the maintenance or lowering of caloric irritability, then we are not dealing with a serous labyrinthitis but with stapes luxation. If the fistula symptom does not show preserved caloric excitability, a serous labyrinthitis can then be diagnosticated. This differentiation is of great importance from a practical standpoint. If we can diagnosticate serous labyrinthitis from the presence of caloric excitability, then we do not disturb the labyrinth; but if we diagnosticate stapes luxation, the labyrinth operation

must be performed at once. A serous labyrinthitis which has led to destruction of the hearing and loss of excitability in the vestibular apparatus cannot be differentiated from a purulent labyrinthitis with the same functional findings. It would be better for the patient if in these cases we perform the labyrinth operation.

Discussion.—NEUMANN thinks serous labyrinthitis can be diagnosticated from purulent labyrinthitis by testing the hearing power. If speech is no longer heard in the diseased ear, but the tuning-fork is still heard through air, or at least through bone conduction, he diagnosticates serous labyrinthitis. Jansen speaks in his article of 15 years' experience with suppurations of the labyrinth. He makes very incomplete hearing tests, and has employed the test for caloric nystagmus the first time but a year ago. His statements are based on material only imperfectly observed.

ALEXANDER remarks that he always examines with compression and aspiration. He believes he can prevent confusion when dealing with caloric nystagmus. Whatever the connection is between vertigo and Gellé's test in normal cases, he thinks we are not dealing here with vertigo but merely with an unpleasant feeling in the ear, as is always the case when air is forced into the ear in this way. With regard to the differential diagnosis between serous labyrinthitis and luxation of the stapes, Alexander believes the most important distinction is the appearance of the symptoms of the former after two or three days, while in stapes luxation the symptoms come on more quickly.

RUTTIN has examined histologically many cases of labyrinth suppuration. Stapes luxation is very rare. Serous labyrinthitis is well established. According to his views Jansen's statistics contain many errors.

HAMMERSCHLAG differs from Neumann's opinion that hearing tests are of value in the differential diagnosis between serous and purulent labyrinthitis, and especially against Neumann's assertion that the test for bone conduction in the diseased ear is of value. Patients with exfoliated cochleæ say they hear the tuning-fork in the diseased ear if it is applied to the mastoid process on that side. The numerous examples of deaf-and-dumb people with hearing remnants

after meningitis prove that hearing remnants may remain in suppurative labyrinthitis.

BÁRÁNY remarked in opposition to Neumann that preserved hearing proves nothing in regard to labyrinthitis in the early stage, as a case he had observed with Neumann showed—which Neumann has apparently forgotten for the moment. He referred to a patient who developed an acute labyrinthitis and meningitis after an ossiculectomy, which ended fatally in two days. On the first day the hearing power for Cs was +6*m*. After twelve hours this was followed by total deafness. The examination with the noise apparatus proves to Bárány that the hearing power of the tuning-fork on the mastoid process of the diseased side in unilateral deafness is only apparent, because when the noise apparatus is placed in the normal ear, the strongly vibrating tuning-fork is no longer heard on the mastoid process of the diseased ear.

ALT presented (1) a 12-year-old boy, upon whom in the surgical clinic a simple mastoid operation was performed; developed facial paralysis after operation. On examination, Alt found a retro-articular opening, profuse otorrhœa, and necrotic bone in the mastoid process. After the operation, which demonstrated complete destruction of the mastoid process, the facial paralysis did not disappear. Conservative treatment for three months was without effect. Alt finally decided to operate again, and exposed the facial, which was pressed upon by a sequestrum. Since then the facial paralysis has cleared up completely.

(2) A child upon whom four and one-half years ago a simple mastoid operation was performed, and who has had a facial paralysis since that time. Otoscopic examination showed a completely epidermised tympanic cavity and slight suppuration coming from the antrum. Alt performed the radical mastoid operation, and exposed the facial throughout its entire course, from the knee above the oval window down to the tip of the mastoid process. Above the oval window it was enclosed in a tight connective-tissue scar. There was no loss of continuity. Fourteen days later there was an improvement in the paralytic symptoms, and after five weeks' active movements in the frontalis and orbicularis.

The patient was then transferred to the medical clinic for massage and electricity. The daily condition gradually became worse than it was five weeks after the operation. Now there is only slight movement of the frontalis and orbicularis, and almost no movement of the mouth. Alt suspects that fresh scar tissue may have formed. He believes that eventually the facial should be divided and embedded in a protective tube, according to Foramitti's method, to guard it against scar tissue.

Discussion.—BONDY presented a patient whose antrum he had opened on account of acute mastoiditis. For the first few days after operation the general condition was good; then the patient had a chill. Upon re-examination the wound was found covered with pus, and the sinus discolored with pus. Ligation of jugular, exposure and opening of sinus. He found a mural thrombus. Bondy excised the affected part of the sinus wall, Hofer sectioned it. The microscopic examination showed very plainly the thrombus. Aspiration would naturally have been of no use. This case proves the superiority of incision over puncture.

RUTTIN demonstrated a microscopic preparation of the Eustachian tube from a tuberculous patient. The epithelium of the tube has supplicated in part. This is of interest because it has hitherto been believed that in the acute otitis of the terminal stage of tuberculosis the infection originates by spreading mechanically. This case proves that the involvement was brought about by the suppurative inflammation of the tube.

BÁRÁNY demonstrated a patient with sinus thrombosis, who complained of earache after influenza, but there was no discharge. Fourteen days later pyæmic fever, swelling, and pain in the right ear developed. Otoscopic examination furnished the picture of an acute otitis in process of subsiding. There was no tenderness of the mastoid. On account of the pyæmic fever Bárány opened the mastoid. He found an unusually thick corticalis, and two or three cells in the antrum filled with pus. With the first few blows of the chisel, the sinus, which was situated very far forward, was exposed. After opening the antrum, Bárány followed the sinus backward. This tore and emptied out pus. Ligation of the

jugular and exposure of sinus to the region of the bulb and 3cm above the knee, enucleation of the entire thrombus. No metastases since operation. Gradual subsidence of fever.

REPORT OF THE TRANSACTIONS OF THE CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY.

By DR. GEO. E. SHAMBAUGH, SECRETARY.

MEETING OF OCTOBER 13, 1908. PRESIDENT A. H. ANDREWS
IN THE CHAIR.

Dr. J. C. BECK exhibited a case of a young child with a **cyst of the epiglottis**. The case had been shown before the Society early in the year, and reported as probably cured by opening the cyst and cauterizing the cavity with electro-cautery. At the present time the cyst has returned and is already causing considerable interference with respiration. Dr. Beck expects soon to undertake to remove the cyst in its entirety.

Dr. BECK exhibited a case of a boy four years old, from whose **left bronchus he removed a small electric lamp**. The foreign body was located very distinctly by means of the X-ray. The bronchoscope was introduced, and the foreign body partially dislodged with the forceps. The patient then expelled the foreign body in a fit of coughing. Dr. Beck questions whether glass foreign bodies could always be depended upon to produce an X-ray shadow. He thinks the reason the outlines of the glass lamp showed so distinctly in this case was due to the use of lead in the manufacture of the glass.

Dr. ANDREWS has seen a number of cases where pieces of glass have produced a shadow under the X-ray.

Dr. BECK exhibited photographs of a nurse who in attempting to improve imaginary defects in her appearance, had **injected large quantities of paraffin**. The result was a

very marked disfigurement. Dr. Beck had succeeded in removing some of the paraffin surgically, as well as parts of the inflamed skin covering the masses. This tissue under the microscope presents much the appearance of a sarcoma, and Dr. Beck called attention to the supposed danger of malignancy from the use of paraffin injections.

Dr. HOLINGER reports a case in which paraffin had been injected for suppuration of the lachrymal tract. The paraffin in this case had miscarried and gone into the lower eyelid, causing an ugly irregular tumor.

Dr. ANDREWS asks if Dr. Beck knows of any reports in the literature that are authentic showing malignancy as the result of paraffin injections. He has seen none in the literature.

Dr. HEAD has incised paraffin tumors, and had little difficulty in squeezing out the masses with practically no scar resulting. He has watched the literature rather closely for a number of years, and has seen no cases reported of malignant generation.

Dr. BECK states that the particular object in presenting the specimen of the paraffinoma was to bring out this particular point regarding malignancy. Kirchner has written more on this subject, perhaps, than anyone else, and has seen spindle-cell formations about the paraffinoma similar to the case which Dr. Beck has just reported. A foreign body always becomes incapsulated, but if paraffin is the foreign body, the connective tissue also traverses the masses of paraffin, giving an appearance not unlike lipoma. There have apparently been no post-mortem reports, but Kirchner has reported cases of metastases. Only one death has followed the use of paraffin that has been reported, and that was a case reported by Pfannenstiel, who had injected paraffin for incontinence in the rectal sphincter.

Dr. HOLINGER reported a case of **extensive abscess involving the faucial tonsils**, the tissues of the neck, and the mastoid process. It did not appear to be a case of Bezold mastoiditis. The mastoid was very much sclerosed—so much so that a number of gouges were broken in chiselling away the process. This he attributed not only to the hardness of the bone, but to the fact that he used a lead mallet.

In syringing the mastoid opening after the operation, so much water would pass into the throat that Dr. Holinger believed a communication other than the Eustachian tube existed.

Dr. ANDREWS asked Dr. Holinger why he held the lead hammer responsible for the breaking of the gouges. He had never discovered that chisels were more likely to break under the lead hammer than under any other.

Dr. HOLINGER presented a microscopic section from a **postnasal growth**, which he believes showed the existence of tuberculosis. Clinically the case presented symptoms of an enlargement of the pharyngeal tonsil, which was covered with a thick muco-purulent secretion.

Dr. BECK states that evidences of tuberculosis have frequently been detected in adenoid growths, and is of the impression that tubercular nodules would be frequently found if we would examine all adenoids removed.

The section which Dr. Holinger exhibits he thinks shows an inflammatory swelling composed of small round cells, probably tuberculoma. The long duration of the symptoms would exclude sarcoma.

Dr. HOLINGER (closing) said that there was considerable difficulty in finding anything more than the diffuse round-cell infiltration, but that several giant cells had been found, which convinced him that the trouble was tuberculous. A large number of eosinophile cells, he thinks, indicates the serious nature of the trouble, and also that it has been one of long standing.

Dr. SHAMBAUGH reported a case of **cholesteatoma causing an erosion into the horizontal semicircular canal**, and discussed briefly the **methods for examining the vestibular apparatus**. The case was that of a man fifty-nine years old, who eleven years previous had a purulent discharge from the right ear, which lasted for several weeks. For several years past he has been annoyed with an accumulation in the canal of the right ear, which he supposed was caused by wax. In attempting to remove this with a hair pin he had set up a marked dizziness and nausea. The mass proved to be a cholesteatoma protruding into the meatus from an opening in the upper posterior wall, which led directly into the antrum.

The membrana tympani showed maceration and thickening, but did not appear to be retracted or perforated. There was a quick response upon syringing the ear with water only slightly colder or warmer than the body temperature. This response was in the character of a nystagmus and pronounced vertigo. On compressing or rarefying the air in the external meatus by means of the Siegel speculum, even the slightest change in pressure resulted in nystagmus and vertigo. The functional examination showed considerable deafness, more marked for the lower tones, with only a slight defect for the highest notes of the Galton whistle. The Weber was distinctly lateralized to the affected ear, and the Rinne was negative.

From these symptoms the diagnosis of an erosion into the horizontal semicircular canal was made, the erosion having made an opening only through the bony capsule, but not through the endosteum. The slight amount of pressure necessary to produce the nystagmus and vertigo in this case shows how very delicate and sensitive is the adjustment of the terminal apparatus in the ampullæ.

Dr. SHAMBAUGH discussed three methods of testing the excitability of the vestibular apparatus. All of the methods are dependent upon producing a motion in the endolymph of the semicircular canals. In the first method, that of the rotating chair, if the semicircular canals are normal and the individual is rotated toward the right, for example, there will be produced a nystagmus toward the right. If the rotation is kept up long enough, all sense of turning, as well as the nystagmus, will disappear. If the rotation is suddenly stopped, a sense of vertigo is produced, and there will be a return of the nystagmus, but directed toward the left. These phenomena can readily be accounted for by the production of a motion in the endolymph of the horizontal semicircular canals. The reason why the sense of turning and the nystagmus disappear after the rotation is discontinued for some time, is explained by the fact that the fluid in the semicircular canals has taken on the motion of the walls of the canal, and therefore does not impinge upon the cupula in the crista ampullaris. The production of vertigo, and of the nystagmus directed towards the opposite side upon suddenly stopping

the turning, is explained by the continuation of the flow in the endolymph of the canals for some time after the turning has been stopped.

The second method of producing a flow in the endolymph of the semicircular canals was the one used in this case in demonstrating the erosion into the horizontal canal. It consists in the production of either pressure or suction of the air in the external meatus. If an opening exists through the bony capsule of the canal, the endolymph will be caused to flow in this or that direction, depending upon whether suction or pressure is used.

The third method of testing the semicircular canals is that elaborated by Bárány, and consists of syringing the ear with hot or cold water. If the vestibular apparatus is intact, symptoms of vertigo and nystagmus can be produced by the use of either hot or cold water. In a case where the semicircular canals are not affected, the reactions obtained are as follows: Syringing with cold water produces a nystagmus which is more pronounced when the eyes are directed towards the opposite side. Syringing with warm water will produce a nystagmus more pronounced when the eyes are directed toward the same side. The vestibular apparatus may be placed in a state of hyperexcitability as the result of irritation, such as may occur from circumscribed suppuration of the labyrinth. Under these circumstances the normal reactions upon syringing with hot and cold water can be obtained. In addition, however, there will frequently be present a spontaneous nystagmus directed toward the affected side.

When the vestibular apparatus is destroyed, no reactions can be obtained by any of the methods for stimulating this part of the internal ear. If the destruction of the nerve endings in the internal ear has been a sudden one, there will be present for a short time a nystagmus toward the normal ear, which has its origin in this ear, and not in the affected one. Disease of the cerebellum, such as tumor or cerebellar abscess, may produce the same symptoms as occur from irritation of the nerve endings in the vestibule—that is, a spontaneous nystagmus directed toward the affected side. One can readily see how this study of nystagmus, both spontaneous and induced, is of great value in the diagnosis not

only of diseases of the labyrinth, but of such conditions as cerebellar abscess and cerebellar tumor.

Dr. HOLINGER questions whether it is feasible to apply the rotating chair examination in the office, since the space will often not permit of this apparatus. He thinks that all of these methods can be best applied in a hospital. He has had some unpleasant experiences in the use of hot and cold water in his office on account of the very severe reactions obtained. He finds that the use of water not too cold or too warm, is necessary if one would avoid an unpleasant severe reaction.

Dr. BECK thinks that Dr. Holinger's remarks might be taken as underestimating the value of the methods for testing the semicircular canals. He thinks the hot and cold water syringing of the ear in the diagnosis of labyrinthine diseases is one of the best things we have learned in otology in recent years. He has used the method in his office to his entire satisfaction. He, of course, would never inject cold water into a suppurative ear except for diagnostic purposes.

Dr. ALLPORT thinks the method of syringing with hot and cold water is our most valuable means of diagnosing diseases of the labyrinth. He has recently observed these tests applied in the clinics in Vienna, where great confidence is placed in their significance. He thinks the objections that were mentioned by Dr. Holinger are after all unimportant and do not detract seriously from the value of the tests.

Dr. ANDREWS has been making some observations regarding vertigo, and believes that we have many things still to learn on this subject. He has experimented with moving objects before the eyes, and finds that dizziness can be produced very readily. This is in accord with Deiters's theory, which locates the centre of equilibrium in the floor of the fourth ventricle. This centre, according to Deiters, receives filaments from the eye, from the ear, and from the gastrointestinal tract, and as a result an irritation from any of these localities may produce vertigo.

REPORT OF THE TRANSACTIONS OF THE SECTION ON OTOTOLOGY, NEW YORK ACADEMY OF MEDICINE

MEETING OF OCTOBER 9, 1908. DR. ARTHUR B. DUEL
CHAIRMAN.

Report of two cases of atypical sinus thrombosis. S. J. KOPETZKY, M.D. (Published in full on pp. 552-557 of this issue.)

Discussion.—Dr. DENCH inquired whether a bacteriological examination of the thrombus had been made in these two cases.

Dr. KOPETZKY replied that unfortunately the pathologist lost the culture in the second case, but from the microscopical appearance his opinion was as stated in the report. The first case, the one that recovered, was not examined bacteriologically.

Dr. DENCH said that in certain cases an aseptic clot was found either in the sinus or jugular vein. An aseptic clot would give rise to no symptoms. In some cases where symptoms were present, the centre of the clot might be perfectly sterile, and either extremity of the clot or the walls of the sinus or vein might contain pathogenic organisms. In one case of sinus thrombosis, in which the thrombus extended into the jugular, he had found the clot perfectly sterile, but the walls of the vein contained streptococci. In cases running an atypical course, it would be interesting to know whether we were dealing with a sterile thrombosis, and it is a question whether an aseptic thrombosis would necessarily prove fatal.

Dr. GRUENING said that in the absence of a pathological examination and the absence of a culture he did not think we were prepared to say what we had to deal with in these

cases. It was also important that the temperature should be taken every three hours, as if the intervals were longer there might be very great variations which were not noted.

Dr. KOPETZKY replied that the temperature had been noted every three hours.

Dr. BERENS said that the second case might be explained in part by the mechanical disintegration of the clot resulting from the use of the mallet and the clot acting as a thrombus.

Dr. DUEL inquired whether the mallet and chisel had been used in the mastoid operation. On receiving a reply in the affirmative, he said that the resulting concussion might have had some influence in the disintegration of the clot on the opposite side, as the reader had suggested.

During the past two years he had endeavored, in his operations on the mastoid, to use the mallet and chisel no more than was absolutely necessary, usually not at all, but to confine himself to the rongeur forceps, hand gouges, and curettes. In all radical operations as well as in acute cases he avoided the use of the mallet and chisel for the same reason.

Danger of the disintegration of a possible thrombus, a possible labyrinthine suppuration, the breaking down of nature's wall in some possible intracranial abscess made it very important that any concussion from the use of the mallet should be avoided.

Dr. HELD said that he was not sure that the chisel was entirely the cause of the trouble in this case, in view of cases which he had reported three or four years ago; but he held that the chiselling was an important factor, as the traumatism from its use had even created psychic disturbances. At the time of his report he had found nothing on the subject excepting an article by Grossman, who reported six or seven cases of psychic disturbances following the radical mastoid operation. Dr. Held spoke of a patient of his who was confined to an institution for three months following the radical mastoid operation for the reason of an acute dementia following the operation, and he believed that the use of the hammer and chisel was the cause. In the second case presented by Dr. Kopetzky he believed that the Doctor was right in ascribing the dissemination of the fatty embolism to the trauma of the hammer and chisel.

Dr. DENCH inquired whether the mental disturbance might not occur in the same proportion of cases following any severe operation upon the long bones. He remembered a case of mental disturbance which followed drainage of the ankle joint. Here, the concussion incident upon the use of the mallet and chisel certainly could not be considered as a causative factor. In over one thousand operations upon the mastoid, in which the mallet and chisel were used, he had not seen a single case in which the concussion had caused the slightest damage. When a search of the literature showed only six cases in which the result could be attributed to the use of the mallet and chisel, he was inclined to think that there was very little danger of concussion in these cases.

Dr. RAE inquired whether he was correct in understanding Dr. Kopetzky to say that he considered post-auricular œdema to be a symptom of involvement of the sinus. With regard to the first case reported, he would like to know whether the sinus was operated on in a case brought in from the clinic. The lack of temperature symptoms afterward does not indicate that they may not have been present before the opportunity offered to have accurate temperature records taken.

Dr. KOPETZKY, replying to Dr. Rae's inquiry in regard to post-auricular œdema, said that he had noticed that where cases come under observation and there is a swelling behind and above the ear presenting the clinical aspect of a subperiosteal abscess, and there is nothing but an infiltrate found upon incision, he finds that the sinus is usually involved. He was not prepared to say that the sinus contained a clot, but in the majority of such cases he finds either a perisinal abscess or pus somewhere about the sinus. This is in line with the observations which he published last year in the *Annals of Otology*. The first case had been under observation and had been seen by him three times a week since October, and the patient had distinctly said that he had no chills, no fever, and had passed a comfortable night; and it was difficult to convince the patient that he needed an operation.

Dr. GRUENING said that the symptom of œdema of the mastoid in sinus thrombosis is well known as the Griesinger symptom.

Case of sinus thrombosis. Presented by Dr. A. P. VOISLAWSKY.

In this case the temperature continued after the operation on the sinus. This patient has been in Dr. Berens's clinic for two years, and came in with an acute exacerbation on top of the chronic condition. A radical operation was performed, and a sinus discovered the size of a ten-cent piece. There were some granulations, but after uncovering as far as was thought safe the patient was put to bed. The temperature continued, however, and on the 16th he had a chill and a second operation had to be performed. The sinus was exposed half way back to the torcular and was found to have collapsed, while there was considerable bleeding from the emissary vein when exposed. Gauze was applied at each end of the sinus and an incision was made. For a moment there was no return flow of blood, but the operator was unable to get a clot. The blood finally returned both ways. Following the second operation, the patient's temperature continued up and down for the next ten days and he had several chills. Another interesting point was that on September 17th his leucocytosis was 30,000, polynuclears 88 per cent. From that time on this continued down, and in 10 days there was a decrease from 30,000 to 16,000, and the polynuclears dropped to 72 per cent. The patient made an uneventful recovery.

Dr. BERENS said that the remarks made by the Secretary about a drop in the temperature immediately after the removal of a septic thrombus does not always hold good—in fact, it has been his experience that in many of these cases there is a phlebitis accompanying the thrombosis in the lateral sinus and extending beyond the thrombus, besides the general constitutional involvement. Until these clear up, there is apt to be an irregular high temperature. This was illustrated very clearly by Dr. Voislavsky's case. Dr. Berens has seen cases post-mortem in which the phlebitis extended from the jugular into the innominate vein.

Dr. GRUENING said that in the Mount Sinai Hospital service they had frequently noticed high temperature after the removal of a clot, and the culture of the blood showed that they were dealing with a streptococcæmia; and the

temperature became normal when that ceased. Only when the blood became sterile did the temperature become low.

Dr. DENCH said that four days before he had operated upon a case which presented some unusual findings at the time of operation. The patient was a woman, twenty-four years of age, who had suffered for thirteen years from sup-puration from the right ear. She had been under local treatment for several weeks before she was seen by the speaker. When first examined by the speaker there was a history of vertigo for one week, with some vomiting. There had also been severe pain in the head for about a week. On examination, the right ear presented the characteristic appearance of chronic suppuration, with the presence of granulation tissue. Following out the dictum which Doctor Dench made at the Otological Society last year, the granulation tissue was not removed, and the patient was kept under observation for several days. Further examination showed that there was no nystagmus, and that there was slight tendency to fall toward the affected side when the patient walked with the eyes closed, or when she jumped forward or backward with the eyes closed. Rotation caused no increase in vertigo. On operation a moderate-sized cholesteatoma was found, filling the mastoid antrum. On exposing the horizontal semicircular canal, a fistula was found, of about one-quarter inch in length, and a smaller fistula was also found in the superior semicircular canal. The roof of the antrum was wanting, and the dura was covered with granulation tissue. The foot-plate of the stapes was found in position. The openings in the semicircular canals were enlarged, and the vestibule freely drained posteriorly. Owing to the fact that the foot-plate of the stapes was present, the oval window was not opened, and the cochlea was not disturbed. Upon recovering from the anæsthetic, the patient had no vertigo, and there was no nystagmus. After the first three days there was a profuse discharge of cerebro-spinal fluid, which necessitated reinforcement of the dressings three or four times in each twenty-four hours. The discharge of cerebro-spinal fluid was gradually diminishing. There had been no nystagmus until on the fourth day after the operation, when there was slight nystagmus on looking

to the opposite side. From the profuse discharge of cerebrospinal fluid, which was turbid at the time of operation, there seems to be no doubt that the patient was suffering from a serous meningitis when operated upon. Owing to the extensive destruction of both the horizontal and superior semicircular canals, it is quite surprising there was no nystagmus, and that the vertigo was not more severe. The patient is making an uninterrupted recovery.

Paper: The application of Arneth's blood charts in the diagnosis of obscure mastoid conditions. By ROBERT MILLIGAN, M.D. (Pittsburg).

Discussion.—Dr. SONDERN said that he had been very much interested in the paper read by Dr. Milligan; that any additional light to be obtained from the blood examination of value in diagnosis is indeed welcome.

The use to which Dr. Milligan puts the Arneth count is certainly original and different from what Arneth and others describe. Milligan uses the increase in the relative number of 1-nuclear polynuclear cells as a diagnostic factor in suppurative inflammation, while Arneth seeks only prognostic value in the number of true phagocytes present. Arneth's basal theory is, that the 1- and 2-nuclear polynuclear cells have no phagocytic power while the 3-, 4-, and 5-nuclear polynuclear cells are the true phagocytes. With a knowledge of the total leucocyte count and the polynuclear percentage, he obtains the number of polynuclear cells in *1 cmm* of blood. The actual number of 3-, 4- and 5-nuclear polynuclear cells in *1 cmm* of blood is the basis for his "Index of Phagocytic Capacity." For example, if there are 30,000 leucocytes and 80% or 24,000 polynuclear cells, and of the latter 3% are 3-nuclear, 2% 4-nuclear, and 10% 5-nuclear, we have 5% of phagocytic cells, or an Index of Phagocytic Capacity of 1200.

Another noteworthy point is the difference in the normal figures quoted by Arneth and those by other observers. Arneth's normal figures are 4 to 9% 1-nuclear, 21 to 47% 2-nuclear, 33 to 48% 3-nuclear, 9 to 23% 4-nuclear, and 2 to 4% 5-nuclear, with an Index of Phagocytic Capacity of 2000. Kownatski (*Beitr. z. Geb. u. Gyn.*, x., 1906) makes his

normal figures in the same order—24, 45, 25, 5, and 1. The figures obtained by Smith and Lansing (*Lying-in Hosp. Bulletin*, March, 1908) are practically the same as those published by Kownatski, namely, 24, 39, 28, 8, 7, 0.3. These differences can only be explained by different conceptions of what are 1-nuclear and what are 2-nuclear cells. The count is certainly not an easy matter and great care must be taken if the results of one observer are to be compared with those of another.

A number of favorable results with the Arneth count have been reported, among others by Chace, in the *Post-Graduate Journal*. He calls attention to the fact, however, that it is of no use in chronic cases.

On the other hand, others have attacked Arneth's basal theory. For example, Kaplan, in the *N.Y. Med. Journal*, April 13, 1907, denies that the 3-, 4- and 5-nuclear polynuclear cells have the greatest phagocytic power. He used staphylococci and defibrinated blood, and found that the 1-nuclear polynuclear cells had the greatest phagocytic capacity. Smith and Lansing, in the article quoted, described their examinations of quite a number of smears obtained from cases of gonorrhœal ophthalmia. They found the polynuclear cells containing the largest number of organisms in the following order, 2-nuclear, 1-nuclear, 3-nuclear, 4-nuclear, and that the 5-nuclear cells contained the smallest number. This experimental work would tend to overthrow Arneth's original claim, and the figures I am about to cite from the article by Smith and Lansing would seem to indicate that the Arneth count, as originally proposed, is of doubtful value clinically considered.

These observers made 315 counts in 138 cases. The average in 30 cases of normal pregnancy was as follows: 48.9% 1-nuclear, 36.5% 2-nuclear, 12.6% 3-nuclear, 1.9% 4-nuclear, 0.1% 5-nuclear, I. P. C. 1152. The average in 61 cases of a febrile parturition was as follows: 59.6% 1-nuclear, 29.7% 2-nuclear, 9.2% 3-nuclear, 1.4% 4-nuclear, 0.1% 5-nuclear, I. P. C. 692. In 156 cases of inflammatory lesion without known suppuration, the average was as follows: 64.4% 1-nuclear, 27.3% 2-nuclear, 7.35% 3-nuclear, 0.7% 4-nuclear, 0.05% 5-nuclear, I. P. C. 840. In 34 cases of inflammation

with suppuration the average was as follows: 69.8% 1-nuclear, 25.6% 2-nuclear, 4.2% 3-nuclear, 0.4% 4-nuclear, 0.02% 5-nuclear, I. P. C. 401.

Counts were made in 29 fatal cases. The two extremes were as follows: 12, 69, 10, 5, 4, I. P. C. 984. The other 97, 3, 0, 0, 0, I. P. C. 0. The average was as follows: 74.7, 20.2, 4.5, 0.3, 0.1, I. P. C. 963. The extreme variations in the above figures indicate how unsatisfactory they are to the clinician.

Aside from the marked variation, if we look at the figures from Dr. Milligan's point of view, they seem quite interesting. It must be remembered that these figures were obtained in cases of pregnancy, while Dr. Milligan's figures are from cases of bone lesion, suppurative in character, chiefly in young children. In this connection it is well to recall that suppurative processes in bone do not give the pronounced changes in the blood noted in similar lesions in the soft parts.

In conclusion Dr. Milligan is to be congratulated on the brilliant results he has obtained from his original manner of using the Arneth count, and every effort should be made by other observers to corroborate them.

BOOK REVIEWS.

V.—A Text-Book of the Diseases of the Ear. By MACLEOD YEARSLEY, F.R.C.S., Senior Surgeon to the Royal Ear Hospital. 452 pages. London: Kegan Paul, Trench, Trübner & Co., Ltd. 1908. Price 18s., net.

This book is an elaboration of the author's "Common Diseases of the Ear." It is practical, concise, and up-to-date. The arrangement of the subject matter is the usual one; there is added an excellent chapter on the influence of general diseases on the ear. The illustrations are generally new and adequate; literary references are furnished on the most important topics. The get-up of the book is the usual admirable one of the English publishers. Mr. Yearsley has written a very useful text-book and one which can be recommended.

A. K.

VI.—The Surgery of the Ear. By Dr. SAMUEL J. KOPETZKY. Illustrated. 368 pages. New York: Rebman Co., 1123 Broadway. 1908. Price \$4.00, net.

This is the fourth American book on the surgery of the ear which has appeared during the last few years. Though the subject has not advanced to this extent, this book differs from its predecessors in that it aims at completeness. The subject is divided into: operations on the external auditory canal, paracentesis, aural polyps, operations to improve hearing in dry middle ear lesions, ossiculectomy, the simple mastoid operation, the radical mastoid operation, the surgery of the labyrinth, operations on the blood-vessels, the surgery of the meninges, surgery of brain abscess, paralysis of the facial nerve, lumbar puncture, ventricular puncture. Each chapter treats of the surgical anatomy, indications, technique, and after-treatment. The author has made a painstaking

study of the German literature and one of the main features of this book is the collection and translation of the opinion of the leading German authorities which should prove very useful for those unable to read German or to whom these references are inaccessible. The illustrations are good and the description of the operations is lucid. The book will prove of interest and useful to those occupied in this field of surgery.

A. K.

VII.—**Lehrbuch der Ohrenheilkunde für praktische Aerzte und Studierende (Text-Book of Otology)**. By Professor A. POLITZER. Vienna. Fifth revised edition. 693 pages. Stuttgart: F. Enke, 1908.

Seven years have passed since the appearance of the fourth edition. The history of Otology has only just been completed, and Politzer with that remarkable working power has completely revised and brought out another edition of his excellent text-book. The main changes will be found in the chapters on the physiology and pathology of the internal ear, especially the terminal distribution of the auditory nerve, nystagmus, functional examination of the vestibular apparatus, and labyrinthine suppurations.

Typical otosclerosis according to Politzer is a clinically well-defined disease. "Spongification of the labyrinth-capsule" is not typical for otosclerosis as this condition may occur in the adhesive middle-ear processes. As for the congestive treatment, the author states that Bier's congestive bandage recently recommended as pain-relieving has not proved successful in his experience. The same holds good for the recently advocated suction apparatus of Clapp. Among other new features are radiographs of the ear, operations on the jugular bulb, the most recent plastic methods in the radical operation and intra-auricular transplantations. The new edition will doubtless be received with the same favor, and the text-book will continue to occupy the leading position.

G. BRÜHL (Berlin).

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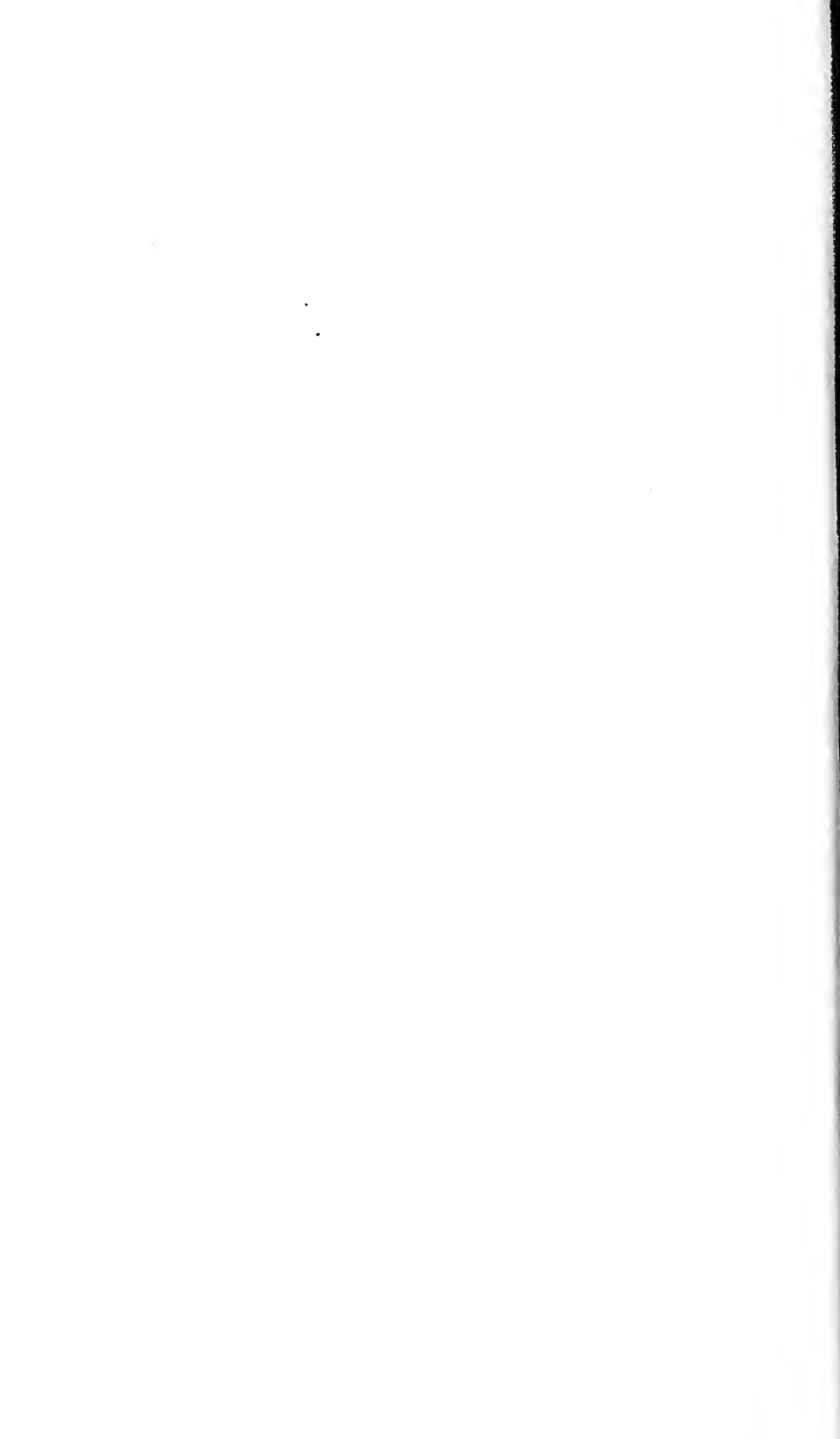
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